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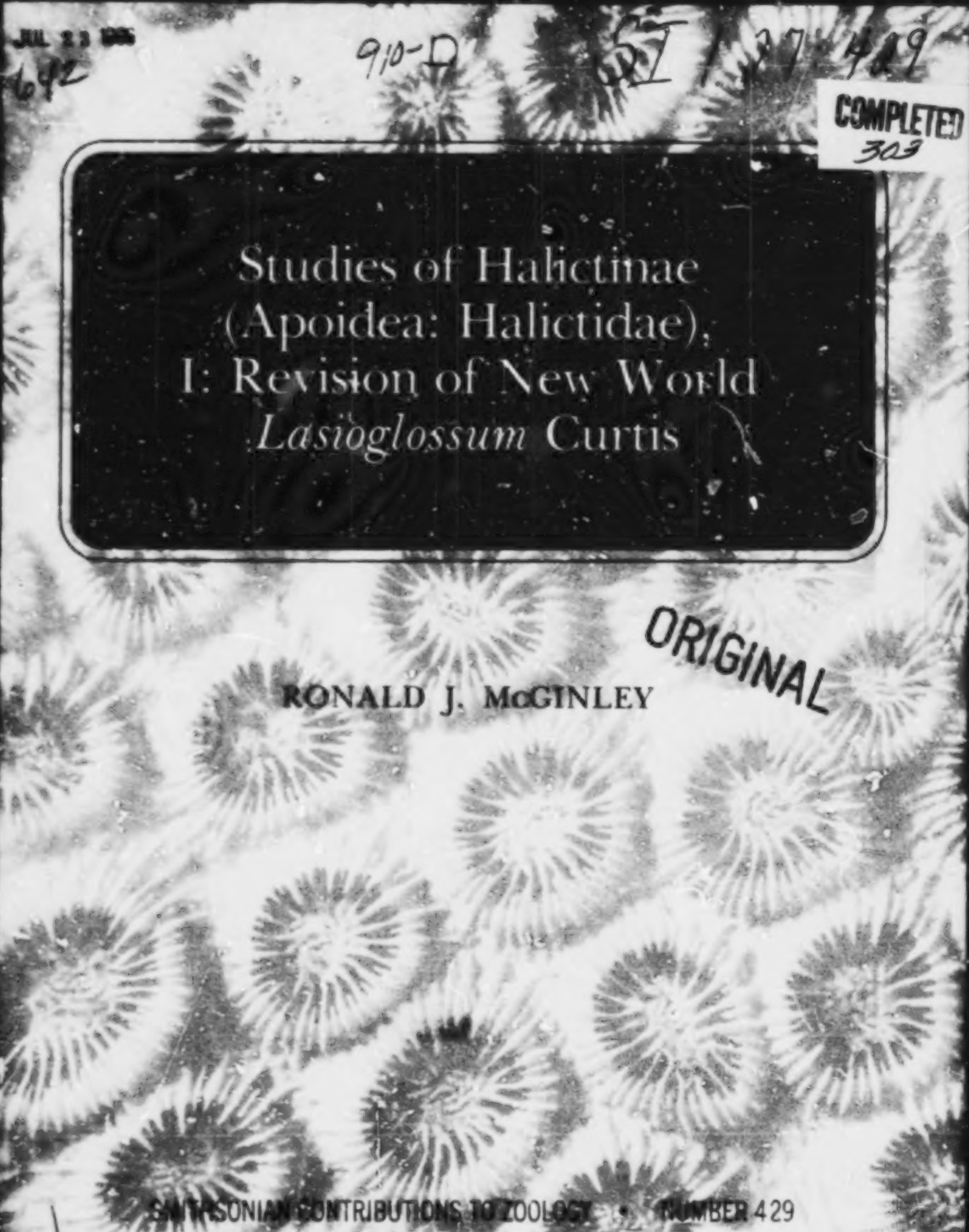

Studies of Halictinae (Apoidea: Halictidae), I: Revision of New World *Lasioglossum* Curtis

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Studies of Halictinae (Apoidea: Halictidae), I: Revision of New World *Lasioglossum* Curtis

Ronald J. McGinley

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ABSTRACT

McGinley, Ronald J. Studies of Halictinae (Apoidea: Halictidae), I: Revision of New World *Lasioglossum* Curtis. *Smithsonian Contributions to Zoology*, number 429, 294 pages, 746 figures, 4 tables, 1986.—The New World species of *Lasioglossum* (sensu stricto) are revised, based on a study of approximately 25,000 specimens. Fifty-one species are recognized, with 20 described as new. All species are fully described and diagnosed. Flight records are summarized with histogram plots, distributions indicated by dot maps, and illustrated keys provided for species identification. Floral association data are summarized (5348 records) and compared to similar data for California Bombini. The association of *Lasioglossum* species with phoretic histiostomatid and scuticarid mites is reviewed and infestation levels for involved species presented. A preliminary study of the phylogenetic interrelationships of included species is presented, which includes a character matrix intended to facilitate future cladistic efforts.

The new species are *L. acarophilum, L. acuminatum, L. anhypops, L. argutum, L. asaphes, L. bajaense, L. cercothrix, L. channelense, L. eickworti, L. katyae, L. lampronotum, L. orphnaeum, L. paraforbesii, L. parkeri, L. perscabrum, L. rupticristum, L. sandrae, L. timberlakei, L. tropidonotum,* and *L. xyriotropis. Lasioglossum egregium* (Vachal) is elevated from junior synonymy, and the following names relegated to synonymy: *Halictus supercretus* Cockerell under *L. circinatum* (Vachal); *H. ripariellus* Cockerell under *L. colatum* (Vachal); *H. matensis* Friese under *L. costale* (Vachal); *H. sericeus* Friese under *L. crocoturum* (Vachal); *H. cyaneiceps* Cockerell under *L. desertum* (Smith); *H. olympiae subangustus* Cockerell under *L. sisymbrii* (Cockerell). A neotype is designated for *H. trizonatus* Cresson and lectotypes designated for *H. costalis* Vachal, *H. matensis* Friese, *H. crocoturus* Vachal, *H. desertus Smith, H. fuscipennis* Smith, *H. manitouellus* Cockerell, *H. pacificus* Cockerell, and *H. sisymbrii* Cockerell. *Halictus schenckii* is treated as a nomen dubium.

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Studies of Halictinae (Apoidea: Halictidae), I: Revision of New World *Lasioglossum* Curtis

V

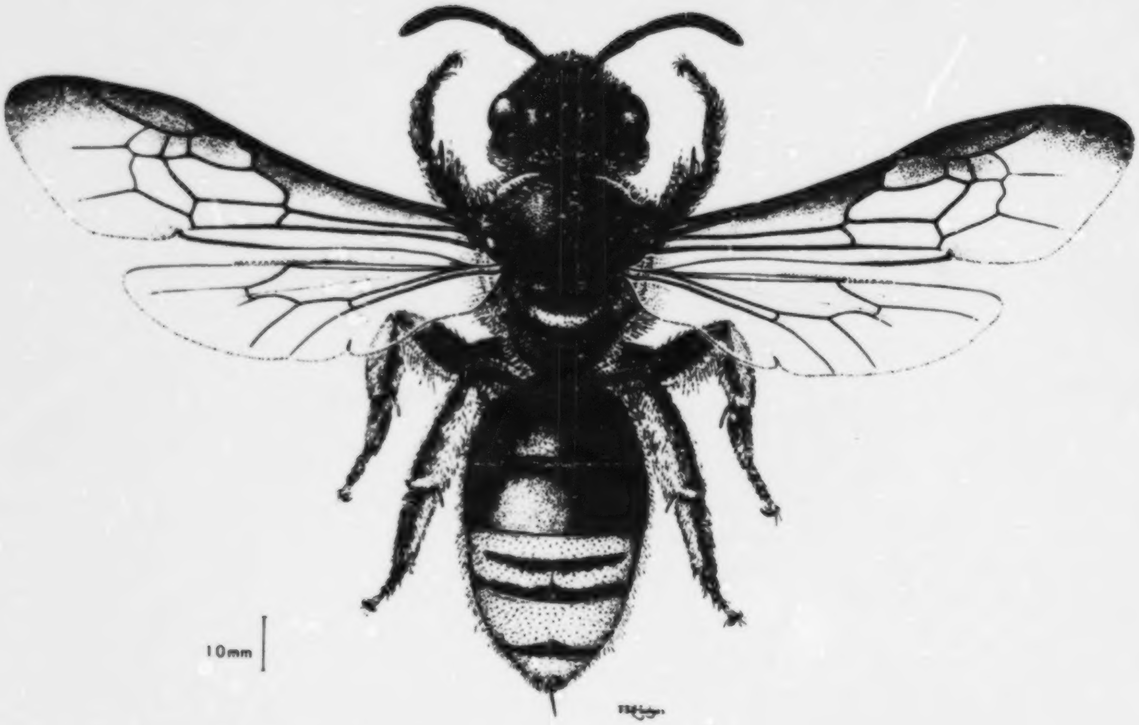

FIGURE 1.—*Lasioglossum crocoturum* (Vachal), female. (Drawn by Elaine R.S. Hodges, Department of Entomology, Smithsonian Institution.)

Studies of Halictinae (Apoidea: Halictidae), I: Revision of New World *Lasioglossum* Curtis

Ronald J. McGinley

Introduction

Halictine bees have attracted increased attention during the past 25 years because of growing interest in social biology and its evolution. The included species display a wide variety of nesting biologies, ranging from those where individuals are strictly solitary to those that form complex, primitively eusocial colonies (Michener, 1974). Furthermore, the nests of many species can be maintained and manipulated under laboratory conditions. However, while biological information for the group has dramatically increased, our understanding of halictine taxonomy has lagged behind, with the notable exceptions of Eickwort's (1969a) generic study of the Augochlorini, Michener's (1978) classification of nonparasitic genera with strong venation, Ordway's (1966) review of *Augochlorella*, Robert's (1972) review of *Agapostemon*, and Ebmer's extensive work on Old World halictids. In a series of papers, Ebmer has reviewed the halictine faunas of central Europe (1970, 1972a,b, 1974c, 1975, 1976b), Iberia (1979), Morocco (1976a), Crete (1981), Israel (1974b), Afghanistan (1974a), Iran (1978a), and Asia (1980, 1983), including Korea (1978b), Manchuria (1978c), and Mongolia (1982). To date, the dominant halictine genera of the Nearctic Region, *Dialictus, Evylaeus, Lasioglossum* (sensu stricto), and the cleptoparasitic *Sphecodes*, have never been comprehensively reviewed. Eickwort is currently revising the Nearctic species of *Dialictus* (188 specific names listed for north of the Mexican border, Hurd, 1979).

The purpose of the present paper is to review and stabilize the taxonomy of the New World *Lasioglossum*. It is hoped that this work will provide outgroup information that will facilitate future taxonomic and phylogenetic studies of *Evylaeus* and *Dialictus*, both of which include numerous social species. Although phylogenetic analyses of morphological characters will be important in the study of halictine comparative behavior, phylogenetic considerations are herein only preliminary in scope; this is for two reasons: the outgroup structure of genera related to *Lasioglossum* is poorly understood, with a number of these genera being undoubtedly artificial as discussed below; second, I have not yet studied the many Old World species of this Holarctic group.

In the New World, *Lasioglossum* ranges from

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the Northwest Territories in Canada (*L. athabascence*) to Panama (*L. crocoturum, L. uyacicola*). Prior to the present work, 36 specific names were recognized for *Lasioglossum* in this area. Of these, five are now relegated to junior synonymy, one (*Halictus schenckii*) is treated as a nomen dubium, and one (*L. egregium*) is elevated from junior synonymy. With 20 new species recognized herein (15 from Mexico and Central America) the number of valid New World *Lasioglossum* species now stands at 51. Ebmer's papers (cited above) indicate that at least 80 specific and eight subspecific *Lasioglossum* names are currently recognized from the Old World fauna.

HISTORICAL ACCOUNT.—Curtis (1833), recognizing the heterogeneity of the genus *Halictus* Latreille, 1804, described the genus *Lasioglossum* to contain a new species having basal hair bands on the abdominal terga that contrasted with the apical hair bands of other *Halictus* species known to him. In his description of *L. tricingulum*, Curtis mentions that the labium is "rather long lanceolate and very pubescent on the sides and at the back . . . ," hence the name *Lasioglossum* or "hairy-tongue." This is somewhat misleading in that the glossae of *Lasioglossum* species are no more hairy than those of other halictids. Subsequent workers ignored Curtis' generic differentiation and continued to describe new species under the older, inclusive concept of *Halictus*. It was not until 1902 that Robertson wrote, "the so-called genus *Halictus* of authors seems to be altogether too heterogenous. I restore *Lasioglossum* and propose two other new genera [*Evylaeus* and *Chloralictus*]." His generic concepts were based primarily on characters of the forewing, in particular the strength or weakness of certain cross-veins (1 r-m, 2 r-m). Later in 1918 Robertson further subdivided his already restricted concept of *Lasioglossum* by proposing the genus *Curtisapis* to include such forms as *L. coriaceum* and *L. fuscipenne,* which are somewhat opaque compared to the relatively shiny *L. leucozonium* and *L. zonulum.* Although this was followed by some workers, including Cockerell, most bee taxonomists avoided this tendency to oversplit generic concepts. Michener (1944) recognzied both *Lasioglossum* and *Halictus* at the generic level but relegated *Evylaeus, Chloralictus, Dialictus,* and related taxa to subgeneric status under *Lasioglossum*. Similar broad generic concepts are used by virtually all Old World bee taxonomists. In recent years, beginning with Mitchell (1960) and later formalized by Hurd (1979), there has been a tendency among many workers in the United States to utilize the more restricted generic concepts of Robertson. Though I follow this approach in dealing with *Lasioglossum* (sensu stricto), it must be emphasized that the generic limits are poorly understood at present and will undoubtedly be revised in the future, as was pointed out by Michener (1974:287). Because most halictine groups have never been comprehensively reviewed, the focus of most current halictine systematic work is alpha-taxonomic; I plan to follow this phase with analyses of higher categories.

BIOLOGY.—Very little information on the biology of New World *Lasioglossum* has been published. Most biological accounts deal with floral associations (e.g., Graenicher (1909), Moldenke and Neff (1974), and Robertson (1929)). Information on nesting biology of most New World species is limited mostly to brief notes, as for *L. forbesii* (Atwood, 1933), *L. leucozonium* (Knerer, 1969; Knerer and MacKay, 1969), and *L. zonulum* (Atwood, 1933; Knerer and Atwood, 1962). Some information is also now available on Dufour's gland chemistry for *L. coriaceum, L. fuscipenne,* and *L. leucozonium* (Duffield et al., 1981; Hefetz et al., 1978).

With his discussion of *L. leucozonium* from Nova Scotia, Atwood (1933) provided the most detailed account available on nesting biology for a New World *Lasioglossum*. He provided a general description of nest sites, nest structure, and burrow dimensions. All immature stages were excavated but not described (to date, the immature stages of *Lasioglossum* have not been described). Even though most *Lasioglossum* species are assumed to be solitary, Atwood made the interesting observation that "in some cases two females must co-operate in digging, because more than one adult was occasionally seen in a hole much earlier than the appearance of the pupae in the cells." Communal behavior has also been reported by Knerer and Schwarz (1976) for *L. bimaculatum* (Dours) in the Mediterranean region. In the same paper, *L. aegyptiellum* (Strand) was also reported to be primitively eusocial in the same region. Obviously much more biological work is needed before the distribution of sociality in the genus can be seriously addressed.

The biological associations of *Lasioglossum* with other invertebrates account for much of the biological literature on the genus. Like other apoid groups, *Lasioglossum* species are commonly taken as prey items by *Philanthus* wasps. This association has been reported for *L. coriaceum, fuscipenne, leucozonium, manitouellum,* and *sisymbrii* (Alcock and Gamboa, 1975; Evans, 1955, 1975, 1982; Evans and Lin, 1959; Reinhard, 1924). The *Philanthus* species involved are listed in the *Lasioglossum* synonymies. The association between *Lasioglossum* and phoretic mites has been reported for *L. coriaceum* (Eickwort, 1979) and *L. titusi* (Linsley and MacSwain, 1959; Whitsel and Schoeppner, 1971; Eickwort, 1979; Delfinado and Baker, 1976). This is reviewed for all *Lasioglossum* species in a following section of this paper. The only report of *Lasioglossum* parasitization is that of a conopid parasitoid (*Thecophora occidensis*) associated with *L. forbesii* in southern Ontario (Knerer and Atwood, 1967).

Linsley (1962) described the "sleeping" behavior of *L. sisymbrii* from southern Arizona. Females "sleep" individually on flower heads and are tolerant of other hymenopteran species "sleeping" nearby.

ACKNOWLEDGMENTS.—This study would not have been possible were it not for the cooperation of the many curators and institutions who kindly lent specimens to me. I am especially grateful to those curators who arranged the loan of primary type material (these collections are indicated with an asterisk in the following listing). The acronyms used follow those of Griffiths (1980) with minor modifications.

AMNH*	American Museum of Natural History, New York (J.G. Rozen, Jr., and M. Favreau)
ANSP*	Academy of Natural Sciences, Philadelphia (D. Otte and D. Azuma)
ASU	Arizona State University, Tempe (F.F. Hasbrouck)
BMNH*	British Museum (Natural History), London, England (G.R. Else)
BYU	Brigham Young University, Provo, Utah (S.L. Wood)
CAS*	California Academy of Sciences, San Francisco (W.J. Pulawski)
CDA	California Department of Agriculture, Sacramento (M.S. Wasbauer)
CMP	Carnegie Museum, Pittsburg, Pennsylvania (G. Ekis)
CNC	Canadian National Collection, Ottawa (L. Masner and M. Sharkey)
CSUFC	Colorado State University, Fort Collins (H.E. Evans)
CU	Cornell University, Ithaca, New York (G.C. Eickwort)
FSCA	Florida State Collection of Arthropods, Gainesville (L.A. Stange)
INHS	Illinois Natural History Survey, Urbana (W.E. LaBerge)
ISU	Iowa State University, Ames (R.E. Lewis)
KSU	Kansas State University, Manhattan (H.D. Blocker)
KU	University of Kansas, Lawrence (C.D. Michener and R.W. Brooks)
LACM	Los Angeles County Museum of Natural History, California (R.R. Snelling)
LGB	personal collection of L.G. Bezark, Sacramento, California
LSU	Louisiana State University, Baton Rouge (J.B. Chapin)
MCPM	Milwaukee City Public Museum, Wisconsin (G.R. Noonan)
MCZ	Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts
MI	personal collection of M. Ivie, Columbus, Ohio
MNHNP*	Muséum National d'Histoire Naturelle, Paris, France (S. Kelner-Pillault)
MSUEL	Michigan State University, East Lansing (R.L. Fischer)
NAU	Northern Arizona University, Flagstaff (C.D. Johnson)
NCSU	North Carolina State University, Raleigh (C. Parron)
NDSU	North Dakota State University, Fargo (E.U. Balsbaugh, Jr.)
NMNH	National Museum of Natural History, Smithsonian Institution, Washington, DC (P.D. Hurd, Jr., and S. Shanks)

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NMSU	New Mexico State University, Las Cruces (J.R. Zimmerman)
NMW*	Naturhistorisches Museum, Wien (Vienna), Austria (M. Fischer)
NYSM	New York State Museum, Albany (T.L. McCabe)
OhS	Ohio State University, Columbus (C.A. Triplehorn)
OkSU	Oklahoma State University, Stillwater (W.A. Drew)
OrS	Oregon State University, Corvallis (W.P. Stephen and G.M. Stonedahl)
PMNHY	Peabody Museum of Natural History, Yale University, New Haven, Connecticut (C.L. Remington and D.G. Furth)
PSU	Pennsylvania State University, University Park (K.C. Kim and V. Haas)
PUWL	Purdue University, West Lafayette, Indiana (A. Provonsha)
ROM	Royal Ontario Museum, Toronto (G.B. Wiggins)
RWB	personal collection of R.W. Brooks, Lawrence, Kansas
SDNHM	San Diego Natural History Museum, California (D.K. Faulkner)
TAM	Texas A and M University, College Station, Texas (S.J. Merritt)
TLG	personal collection of T.L. Griswold, Logan, Utah
TOR	University of Toronto (G. Knerer and L. Packer)
UAE	University of Alberta, Edmonton (G.E. Ball and D. Shpeley)
UAF	University of Arkansas, Fayetteville (C. Carlton)
UAT	University of Arizona, Tucson (F.G. Werner and C.A. Olson)
UCB	University of California, Berkeley (J.A. Chemsak, H.V. Daly, and K. Sorensen)
UCD	R.M. Bohart Museum of Entomology, University of California, Davis (R.W. Thorp and R. Schuster)
UColB*	University of Colorado, Boulder (U.N. Lanham)
UConS	University of Connecticut, Storrs (J.A. Slater and J.E. O'Donnell)
UCR	University of California, Riverside (S.I. Frommer)
UGa	University of Georgia, Athens (Cecil L. Smith)
UIM	University of Idaho, Moscow, Idaho (J.B. Johnson)
UMA	University of Massachusetts, Amherst (T.M. Peters)
UMMZ	University of Michigan, Museum of Zoology, Ann Arbor (T.E. Moore and M.F. O'Brien)
UMaO	University of Maine, Orono (E.A. Osgood)
UMC	University of Missouri, Columbia (R. Blinn)
UMO*	University Museum, Oxford England (M.J. Scoble and C. O'Toole)
UMSP	University of Minnesota, St. Paul (P.J. Clausen)
UND	University of North Dakota, Grand Forks (P.B. Kannowski)
UNH	University of New Hampshire, Durham (D.S. Chandler)
UNL	University of Nebraska, Lincoln (B.C. Ratcliffe)
UNR	University of Nevada, Reno (R.W. Rust)
USNM*	former United States National Museum, collections now deposited in the National Museum of Natural History (NMNH), Smithsonian Institution, Washington, DC (P.D. Hurd, Jr., and S. Shanks)
USU	Utah State University, Logan (G.E. Bohart and T.L. Griswold)
UWL	University of Wyoming, Laramie (R.J. Lavigne)
UWM	University of Wisconsin, Madison (S. Krauth)
VPI	Virginia Polytechnic Institute, Blacksburg (M. Kosztarab)
WSU	Washington State University, Pullman (W.J. Turner and R.S. Zack)
ZMHU*	Institut für Spezielle Zoologie und Zoologisches Museum der Humboldt Universität, Berlin, Germany (F. Koch)

An attempt was made to augment the level of illustrative materials included in this monographic effort. This would not have been possible without the unique support provided by the Smithsonian Institution and by the following people whose help I greatly appreciate. S.G. Braden, W.R. Brown, and H. Wolf took the scanning electron micrographs; W.D. Hope provided critical materials and advice on methods for mounting very small specimens on SEM stubs; K. Ruetzler provided the use of his compound microscope to photograph the sternal plates; K.P. Smith photographed the sterna and also provided translations of Vachal's papers; V.E. Krantz photographed heads and wings and provided prints of all photographs utilized; H.H. Aceto assisted in map production by photoreducing oversize base maps and acetate overlays. I would also like to thank D.C. Fisher and B.J. Spann for encouraging the use of the illustrated keys and for their assistance in all matters related to the final production of this paper. Special thanks for artistic support go to E.R.S. Hodges, who provided all of the excellent drawings included as well as general advice and support throughout the course of this study.

This project would have taken far longer to complete were it not for the able assistance of S. Shanks, who provided general technical help and discussion. I also thank N.E. Woodley for general discussions and comments and G.C. Steyskal for help in forming Greek and Latin names and M.F. Mickevich for invaluable help in the phylogenetic analysis and running of the PHYSYS program. Finally, I would like to express my thanks to R.W. Thorp and G.C. Eickwort, who critically reviewed and greatly improved the manuscript. Eickwort encouraged this study from its inception and generously provided critical specimens and information throughout.

MATERIALS AND METHODS

This study was based on an examination of approximately 25,000 specimens borrowed from 65 institutions and three personal collections. Institutions, curators, curatorial associates, and acronyms are listed in the Acknowledgments section. An estimate of the relative abundance of the species examined can be obtained from the checklist of New World *Lasioglossum* (Table 1).

TABLE 1.—Checklist of New World *Lasioglossum* and numbers of specimens examined.

Species	Total	Females	Males
L. acarophilum, new species	79	77	2
L. acuminatum, new species	462	328	134
L. aequatum (Vachal)	3	3	–
L. anhypops, new species	875	613	262
L. argutum, new species	149	116	33
L. asaphes, new species	67	61	6
L. athabascense (Sandhouse)	361	279	82
L. bajaense, new species	3	3	–
L. bardum (Cresson)	111	111	–
L. cercothrix, new species	20	19	1
L. channelense, new species	295	134	161
L. circinatum (Vachal)	38	38	–
L. citerius (Vachal)	1	1	–
L. colatum (Vachal)	277	265	12
L. coriaceum (Smith)	2442	1786	656
L. costale (Vachal)	28	22	6
L. crocoturum (Vachal)	14	9	5
L. desertum (Smith)	545	129	416
L. egregium (Vachal)	894	686	208
L. eickworti, new species	15	11	4
L. forbesii (Robertson)	196	147	49
L. fuscipenne (Smith)	678	331	347
L. heterorhinum (Cockerell)	201	182	19
L. jubatum (Vachal)	61	49	12
L. katyae, new species	14	14	–
L. lampronotum, new species	74	64	10
L. leucozonium (Schrank)	1740	709	1031
L. manitouellum (Cockerell)	299	248	51
L. mellipes (Crawford)	650	549	101
L. morrilli (Cockerell)	64	54	10
L. olympiae (Cockerell)	857	800	57
L. orphnaeum, new species	8	7	1
L. pacificum (Cockerell)	663	541	122
L. pallicorne (Vachal)	50	16	34
L. paraforbesii, new species	1060	949	111
L. parkeri, new species	1	1	–
L. pavonotum (Cockerell)	845	619	226
L. perscabrum, new species	3	3	–
L. pharum (Vachal)	52	52	–
L. rupticristum, new species	21	21	–
L. sandrae, new species	3	3	–
L. sisymbrii (Cockerell)	4940	3397	1543
L. timberlakei, new species	266	247	19
L. titusi (Crawford)	1473	1315	158
L. transvorsum (Vachal)	43	38	5
L. tricnicos (Vachal)	8	5	3
L. trizonatum (Cresson)	599	472	127
L. tropidonotum, new species	2	1	1
L. uyacicola (Cockerell)	14	13	1
L. xyriotropis, new species	7	7	–
L. zonulum (Smith)	3255	1802	1453

Label data for all specimens were completely recorded. This information is presented for type material of all new species and for uncommon species with fewer than 150 known specimens. Label data for primary type material and paratypes are presented exactly as given, with bracketed annotations included to complete abbreviations or clarify ambiguous information (collection dates were not converted to the day-month-year convention used elsewhere in this study, in order to facilitate exact label identification). For more common species, collector names and collection dates are deleted and only the county is listed where five or more localities are known within a given county. Flower records are presented in a separate section for each species, following the format of Thorp et al. (1983). The

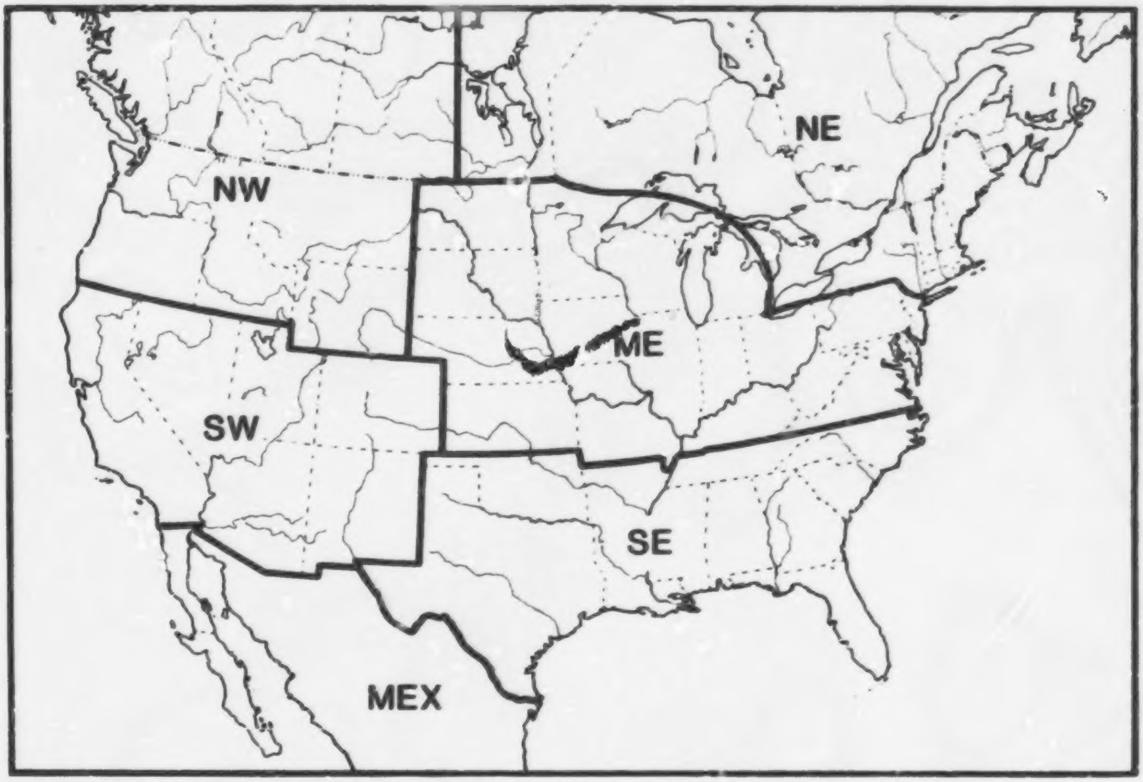


FIGURE 2.—Faunal regions and abbreviations used in histogram plots of flight data (ME = middle-eastern region, MEX = Mexico and Central America, NE = northeastern region, NW = northwestern region, SE = southeastern region, SW = southwestern region; modified from Tangelder, 1983; see "Materials and Methods").

work sheets containing complete label data, including the occurrence of phoretic mites and presence of pollen loads, are available from the author or from the Smithsonian Archives. All specimens examined were individually labeled with determination labels.

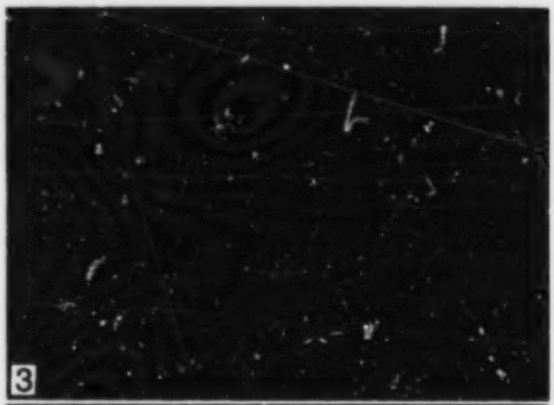
Flight-period data are summarized in histogram plots following the method of Tangelder (1983), with slight modification. The plots present the number of specimens collected for half-month periods. Such diagrams often plot the number of collections or lots (not specimens) for a given time unit, which removes the variable of differences in collecting intensity; however, this approach will not be sensitive to differences in species abundance through time. Given that both approaches have drawbacks, I have chosen to plot the number of specimens collected per unit time. Following Tangelder, I have subdivided the histograms into regional subplots as presented in Figure 2. Where the number of specimens collected for a given half-month period is very small, the corresponding histogram bar is sometimes plotted at a higher specimen number in order to avoid confusion. For example, if only two specimens were collected in a half-month period, for a given scale it may only be possible to differentiate between zero, five, and 10 specimens, in which case the lowest unit of five specimens (not two) is plotted.

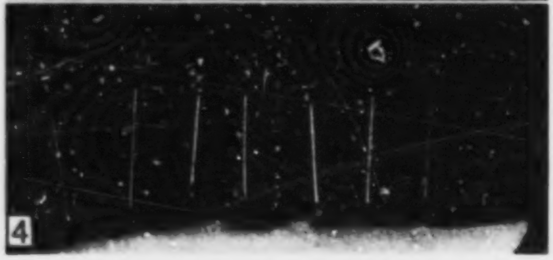
Three different base maps were used to plot species distributional data. For species occurring in the United States and ranging into Mexico and/or Central America, a Goode map of North America was used (dot diameter equals approximately 75 miles). Mexican species were plotted using a map prepared by Y.T. Sohn (NMNH staff artist; dot diameter equals approximately 27 miles). For species occurring in the United States and/or Canada a map prepared by E.R.S. Hodges (NMNH staff artist) was used. This is a composite map consisting of a United States map prepared by the Bureau of the Census, U.S. Department of Commerce, with the Canadian provinces drawn in. Dots (diameter equals 50 miles) were applied to acetate overlays and the maps then photographically reduced by a Horizontal D.S. Process Camera (Smithsonian American History Photo Lab).

All drawings were made with a Wild M5 stereomicroscope and camera lucida. Illustrations were enlarged with a microprojector and then made bilaterally symmetrical.

Photographs of male sterna VII–VIII were taken with a Reichert Zetopan microscope and a Kam ES semiautomatic camera. The material was cleared in cold potassium hydroxide for approximately two hours and stained with acid fuschin for one hour. Remaining tissue was removed with fine dissecting needles and the sterna then mounted in glycerin under a cover slide.

Scanning electron micrographs were taken with a Cambridge 250. Specimens were coated with gold palladium and most micrographs taken at 10 keV. Specimens were cleaned with a fine brush or by applying a fine coat of rubber cement that was carefully removed after drying. Hairs were removed with small pieces of Scotch® tape held by fine forceps under a stereomicroscope. Male genitalia prepared for the SEM were not cleared with cold potassium hydroxide as were most specimens, but rather cleaned with a fine brush (some tissue in the gonobase was removed with fine forceps and needles), processed in a Samdri-790 critical-point dryer, and glued with a polyvinyl acetate (PVA) mixture to the end of a fine tungsten filament as in Figure 3. The same mounting technique was used for the labra (Figure 4) and tibial spurs.





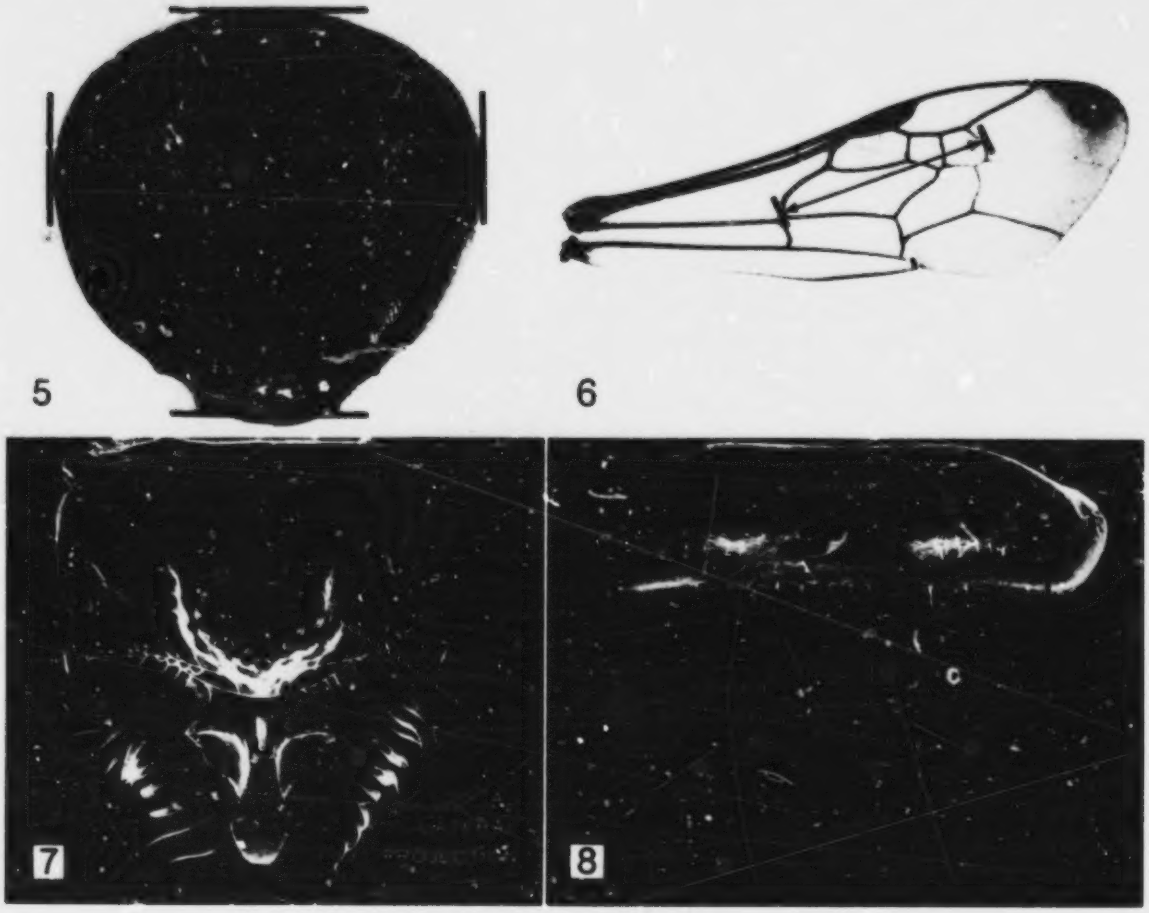
FIGURES 3, 4.—Mounting technique for SEM stubs: 3, *Lasioglossum* male genitalia; 4, *Lasioglossum* female labra.

Appendix 2 contains identifications of figures used in the keys.

The species description format generally follows that of Eickwort (1978), with the inclusion of individual character numbers intended to facilitate character comparisons between species. The descriptions are composite but were initially based on single specimens of a *Lasioglossum* synoptic collection that will be maintained in the NMNH collection for use by future workers. After the initial single-specimen description was completed, intraspecific character variation was included after an examination of a series of specimens (usually 20 to 30 specimens were carefully checked against the description). All measurements were taken using a Leitz stereomicroscope with an ocular micrometer at 12.5 magnification.

DISCUSSION OF CHARACTERS

The intention of this section is to introduce the new characters used in this study and hope-



FIGURES 5–8.—Measurements and terminology: 5, *Lasioglossum fuscipenne* male head showing head length and width measurements; 6, *L. manitouellum* wing showing wing length measurement; 7, *L. asaphes* female labrum; 8, *L. acarophilum* male labrum.

fully to remove as many general terminological ambiguities as possible. Only those characters and terms requiring clarification are discussed below (identifying character numbers are used consistently throughout).

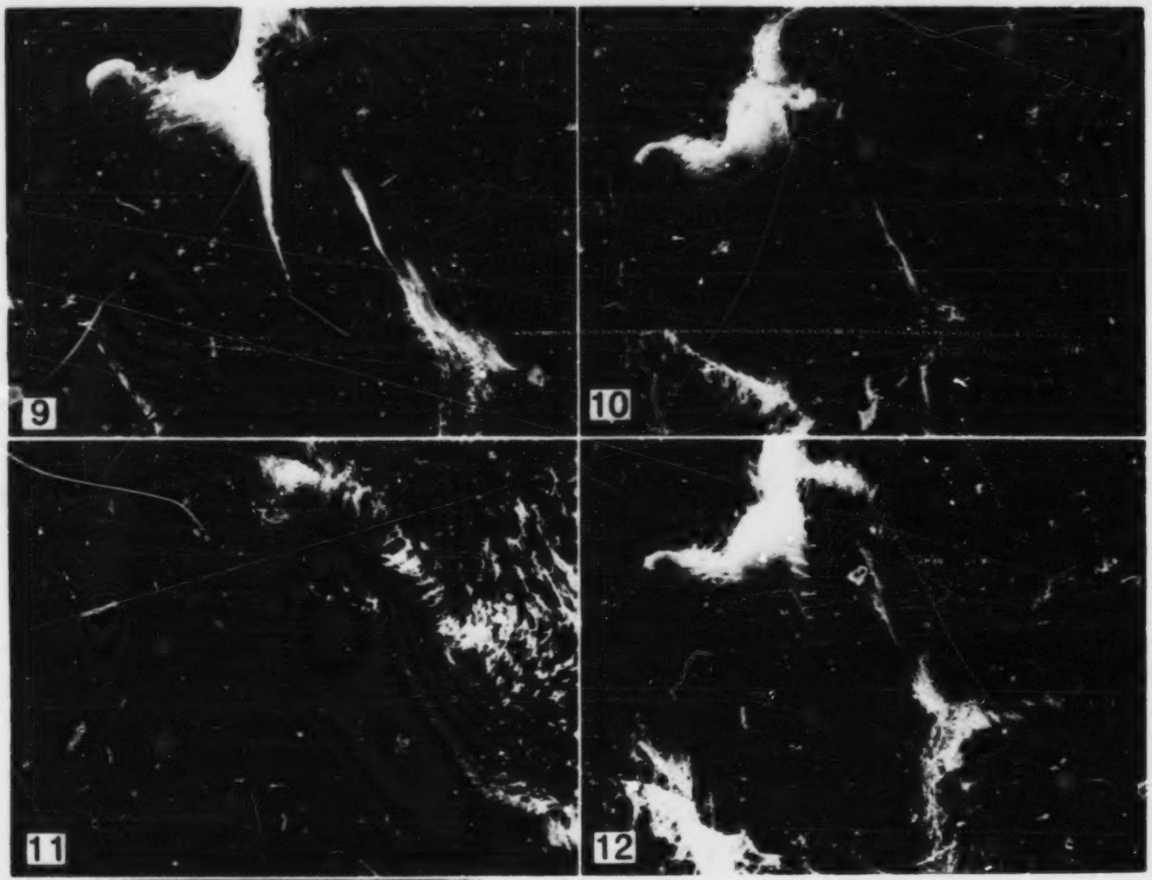
1. *Body length:* This measurement was preferably taken from uncurled specimens; separate measurements of the head, thorax, and abdomen were tallied for highly curled bees.

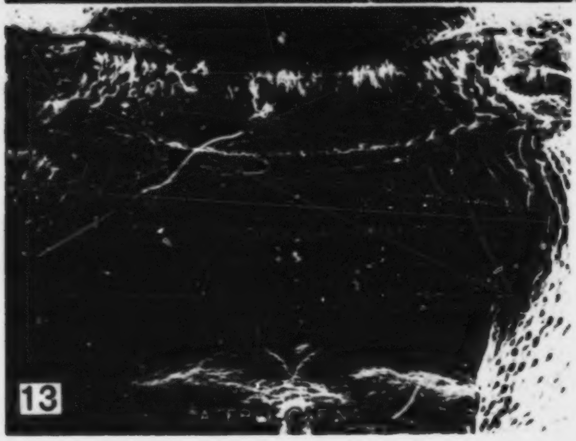
2. *Wing length:* Total wing length can be precisely measured only for those specimens with unworn wing tips. Because of this, wing length measurements were taken from the base of the arcuate basal vein (vein M) to the distal-most extension of the third submarginal cell (vein 2 r-m; Figure 6).

3. *Abdominal width:* This measurement was taken at the widest point of the abdomen near the apex of tergum II.

4. *Head length/width ratio:* Head length was measured from the top of the vertex to the ventral margin of the clypeus; head width was measured at the widest point of the head across the compound eyes (Figure 5).

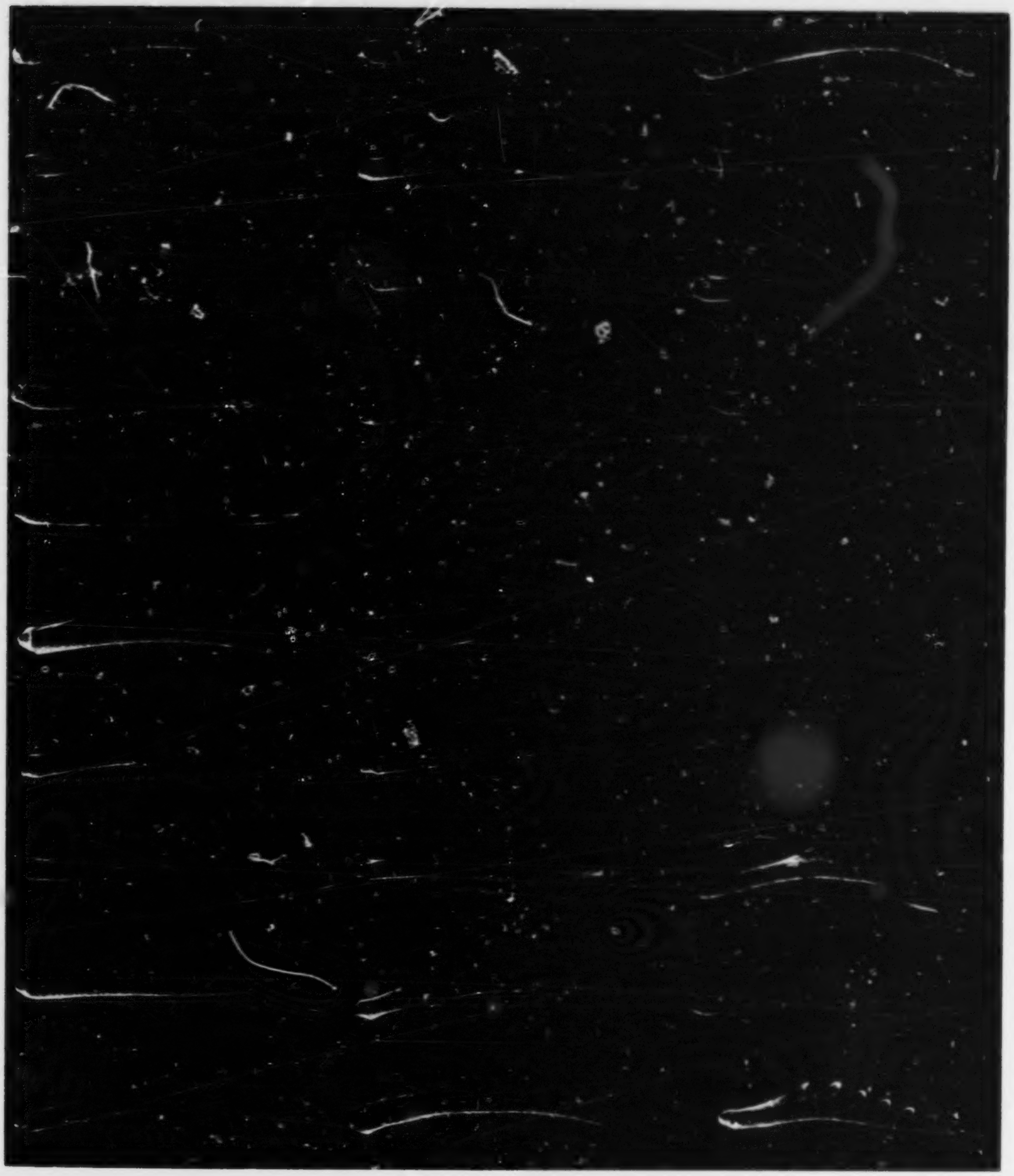
9. *Clypeal projection below compound eyes:* The portion of the clypeus projecting below the ventral margin of the compound eyes was reported by Eickwort (1978) for *Mexalictus* and varies considerably among *Lasioglossum* species. Because of time considerations, only a rough estimate of this projection is given, in that only one specimen for each species was measured.





FIGURES 9–12.—*Lasioglossum* female pronota: 9, *L. pallicorne;* 10, *L. egregium;* 11, *L. transvorsum;* 12, *L. pacificum*.

FIGURE 13.—Female *L. fuscipenne* propodeum and terminology.



11. *Clypeal sulcation:* The clypeus of many *Lasioglossum* species has a median longitudinal sulcation or groove. Although considerable intraspecific variation exists, the sulcation is clearly better defined in certain species and is especially developed in many Mexican forms. It is reported herein for possible phylogenetic consideration in the future.

24–29. *Labrum:* Labral terminology follows that of Eickwort (1969a:340). The females of most *Lasioglossum* species have what are herein termed "distal lateral projections" that vary considerably in size and shape (Figure 7). Certain *Lasioglossum* males have a conspicuous depression on each side of the labrum, herein referred to as a "basal lateral depression" (Figure 8).

33, 34. *Pronotal lateral ridge:* The morphology of the lateral pronotum, especially the complete or incomplete nature of the pronotal lateral ridge, has been used extensively in the systematic studies of *Andrena* by W.E. LaBerge (1964). Based on his suggestion to examine this feature in *Lasioglossum*, I found this to be a most useful character for species recognition. In a number of species the ridge is complete as in *L. pallicorne* (Figure 9) and *L. xyriotropis* (Figure 732), where the ridge is very sharply edged. Occasionally the ridge will superficially appear to be complete but is actually microscopically interrupted as in *L. transvorsum* (Figure 11). The majority of *Lasioglossum* species have the ridge distinctly interrupted by an oblique lateral sulcus as in *L. egregium* (Figure 10). Usually the sulcus is very narrow but can be conspicuously broad as in *L. pacificum* (Figure 12). Where present, the lateral sulcus delimits a "lower portion of the lateral ridge" that can be sharply edged (Figure 10) to broadly rounded and inconspicuous (Figure 12).

40. *Relative length of propodeal dorsal surface to scutellum and metanotum:* As stated above for the clypeal projection (character 9), only an approximate estimate of relative propodeal length is given, because only one specimen for each species was measured.

43. *Propodeal triangle:* Terminology associated with the dorsal propodeal surface is presented in Figure 13, i.e., propodeal triangle, median V-shaped elevation and lateral carina.

45. *Tibial spur:* Bees typically have two spurs at the apex of each hind tibia, the inner one of which is variously branched or toothed in female halictines. Because this spur is usually illustrated for the group, an SEM micrograph or a drawing is provided for a representative of each species (Figures 14–60; micrographs were combined into unified plates to facilitate comparison of the subtle differences involved). However, a detailed analysis of intraspecific variation as presented by Eickwort and Fischer (1963) was not attempted. It is hoped that gross patterns of variation in spur morphology as documented in the included illustrations will be of interest to future workers considering halictine higher classification.

FIGURES 14–43.—*Lasioglossum* female inner tibial spurs: 14, *L. acarophilum;* 15, *L. acuminatum;* 16, *L. aequatum;* 17, *L. anhypops;* 18, *L. argutum;* 19, *L. asaphes;* 20, *L. athabascense;* 21, *L. bajaense;* 22, *L. bardum;* 23, *L. cercothrix;* 24, *L. channelense;* 25, *L. circinatum;* 26, *L. colatum;* 27, *L. coriaceum;* 28, *L. costale;* 29, *L. crocoturum;* 30, *L. desertum;* 31, *L. egregium;* 32, *L. eickworti;* 33, *L. fuscipenne;* 34, *L. heterorhinum;* 35, *L. jubatum;* 36, *L. katyae;* 37, *L. lampronotum;* 38, *L. leucozonium;* 39, *L. manitouellum;* 40, *L. mellipes;* 41, *L. morrilli;* 42, *L. olympiae;* 43, *L. orphnaeum.*

46. *Lateral edge of second abdominal tergum:* The shape of the second tergal edge has apparently not been previously utilized in halictine systematics. In most *Lasioglossum* species this edge is gently sinuate as in *L. mellipes* (Figure 61); however, the edge can be rounded as in *L. titusi* (Figure 62), nearly straight as in *L. egregium* (Figure 63), or sharply excavated as in *L. coriaceum* (Figure 64) (throughout this paper, "tergum/sternum I" refers to those sclerites of the first abdominal segment).

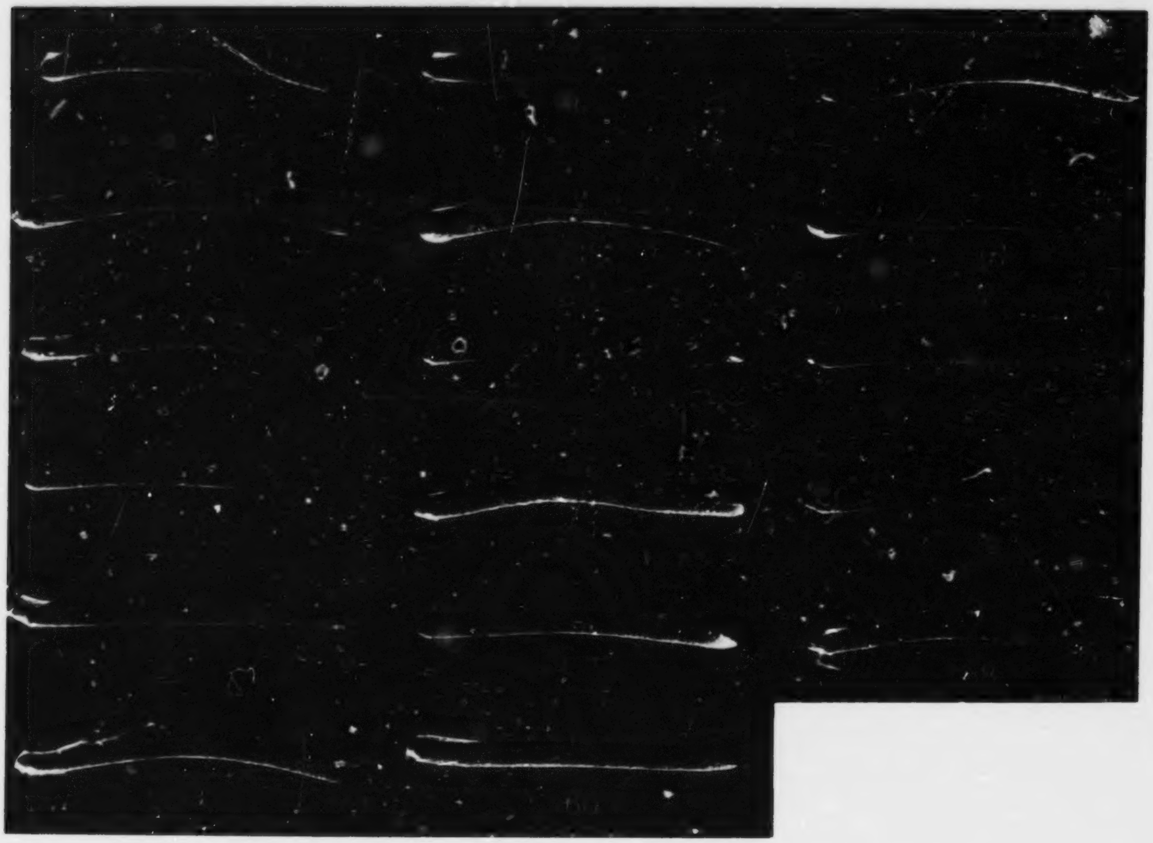
80. *Acarinarium:* The acarinarium (mite-containing area) in most *Lasioglossum* species associated with phoretic mites is a glabrous area surrounded by a conspicuous hair fringe at the base of the first abdominal tergum (Figure 72). The size and shape of the glabrous area and configuration of fringe hairs varies considerably among involved species. See "Mite Associations" section for further details.

82, 83. *Male sternal vestiture:* For most species only the vestiture of sterna IV–V is described. Hair patterns are most commonly described in terms of involving erect hair tufts (Figure 212) or adpressed lateral hair lobes/fringes along the posterior sternal edge (Figure 214). Many *Lasioglossum* males have what is herein termed a "median rosette of erect hairs" as in Figure 213.

84, 85. *Male sterna VII–VIII:* Sternum VII of all New World *Lasioglossum* (and many other halictines) has a protruding medial area herein referred to as the "median process" (Figure 66). The median process of sternum VIII is absent in many *Lasioglossum* species (Figure 567) but, where present, varies considerably in size and form.

88. *Retrorse membranous lobe:* The conspicuous membranous lobes found on the ventral surface of most *Lasioglossum* male genitalia (Figure 65) have been refered to as "retrorse lobes" by both Mitchell (1960) and Michener (1978). These structures were also called "ventral flaps" by Eickwort (1969b), who used them to characterize the Halictini (Eickwort, pers. comm., now prefers the terminology of Mitchell and Michener).

Terminology related to surface sculpturing follows Harris (1979); below, his definitions are presented (in part) and appropriate figures in the present paper cited.



FIGURES 44–60.—*Lasioglossum* female inner tibial spurs: 44, *L. pacificum;* 45, *L. pallicorne;* 46, *L. paraforbesii;* 47, *L. pavonotum;* 48, *L. perscabrum;* 49, *L. pharum;* 50, *L. rupticristum;* 51, *L. sandrae;* 52, *L. sisymbrii;* 53, *L. timberlakei;* 54, *L. titusi;* 55, *L. transvorsum;* 56, *L. tricnicos;* 57, *L. trizonatum;* 58, *L. tropidonotum;* 59, *L. uyacicola;* 60, *L. zonulum.*

Alveolate (Figure 107), "honeycombed"; here used for microscopically honeycombed surfaces that appear dull through the light microscope.

Doubly-punctate (Figure 105), surface with punctures of two distinct sizes.

Granulate, "covered with or made up of very small granules."

Granuloso-punctate (Figure 150), fine to coarse contiguous punctation, giving surface a dull, granulate appearance.

Porcate (Figure 127), "with several parallel, longitudinal ridges with deep, broad sulcations."

Reticulate (Figure 130), "superfically net-like or made up of a network of lines."

Rugose, wrinkled.

Rugulose (Figure 292), minutely wrinkled.

Ruguloso-striolate (Figure 108), very fine longitudinal lines that are also minutely but noticeably wrinkled.

Scabriculous (Figure 548), minutely scabrous.

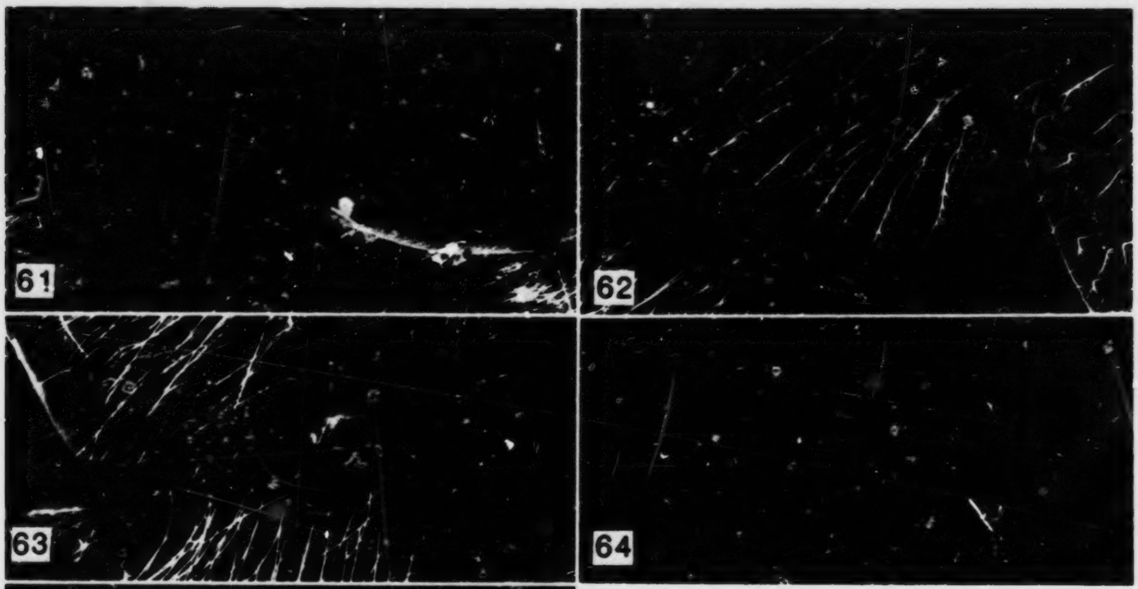
Scabrous, "rough; irregularly and roughly rugose."

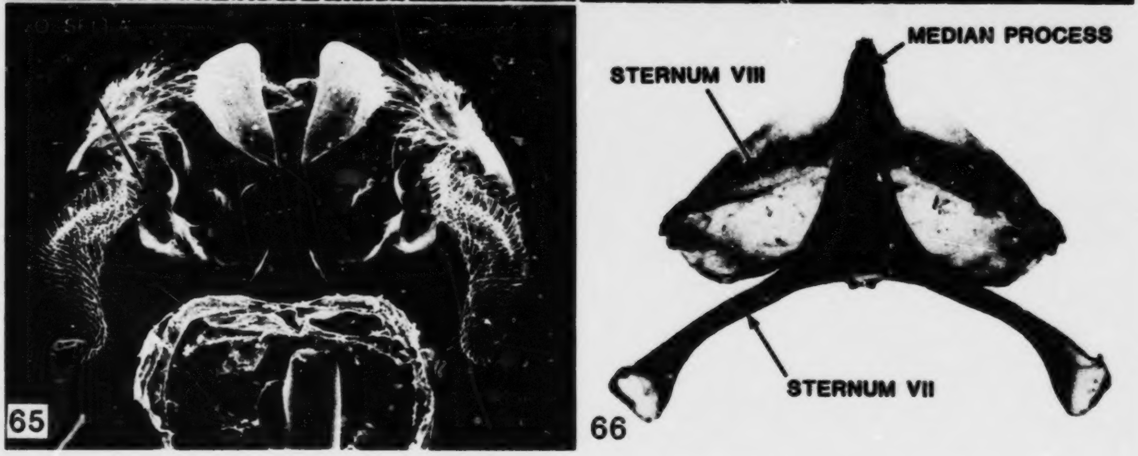
Striate (Figure 636), "marked with parallel, fine, longitudinal impressed lines or furrows."

Striolate, "minutely or finely striate."

PHYLOGENY

The phylogeny of New World *Lasioglossum* species is here treated only in a preliminary manner. This is because the group is holarctic and I have not yet studied the many Old World species that have been reviewed by A.W. Ebmer (see Literature Cited section). Furthermore, we cur-



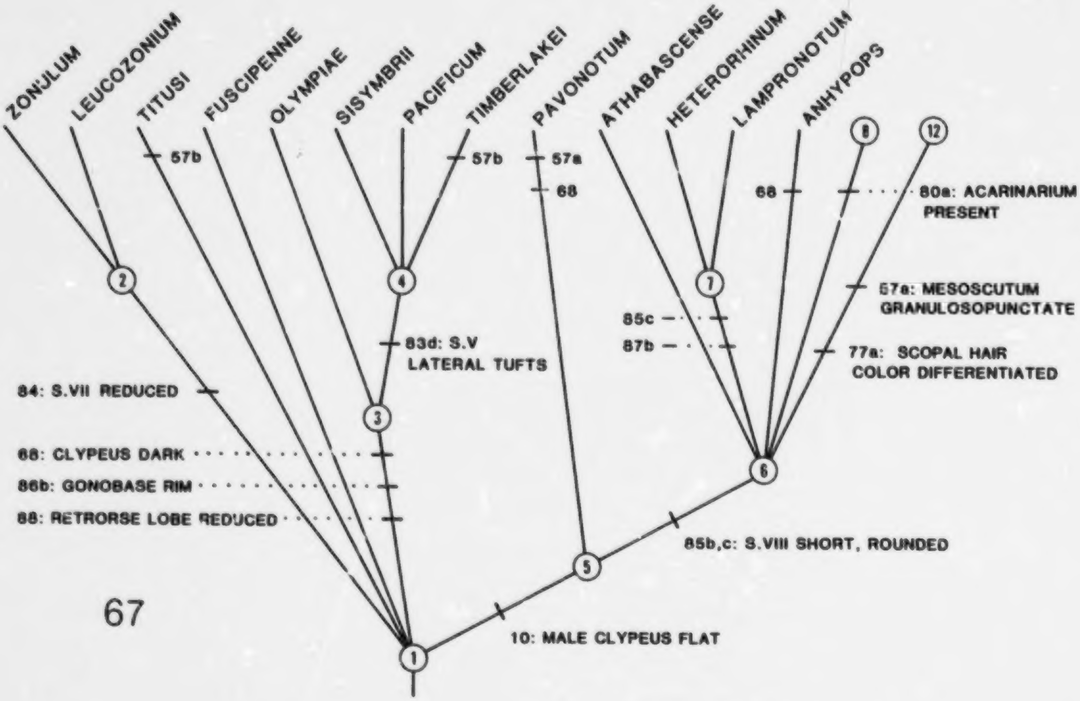


FIGURES 61–64.—Lateral edge of female tergum II: 61, *L. mellipes;* 62, *L. titusi;* 63, *L. egregium;* 64, *L. coriaceum.*

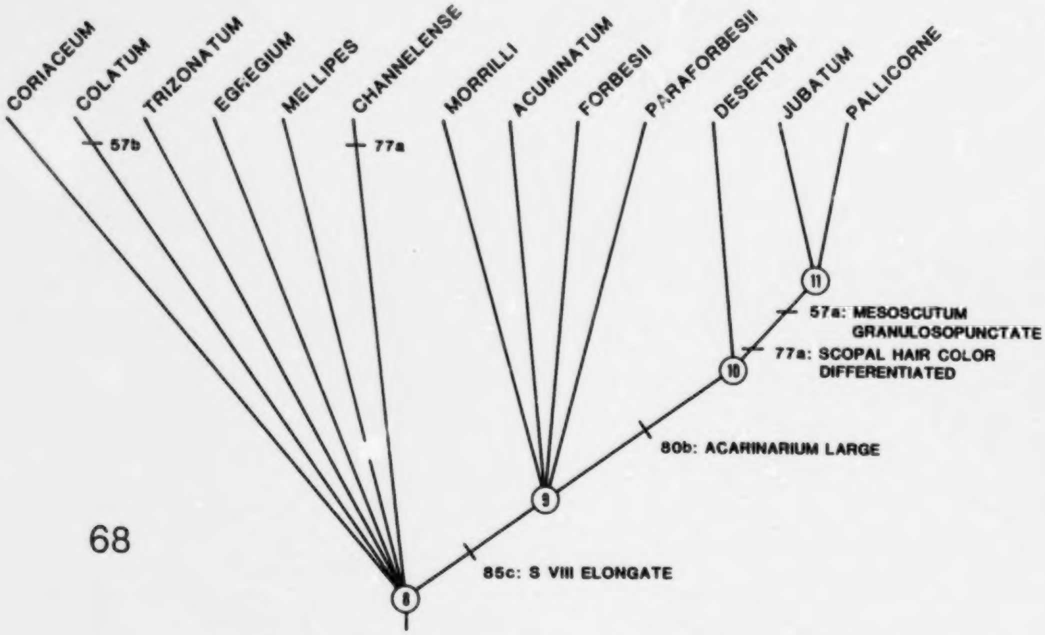
FIGURES 65, 66.—Male *L. athabascense:* 65, genitalia, ventral view; 66, sterna VII–VIII.

rently lack even gross estimates of halictine generic interrelationships, which makes character polarity assessments based on outgroup analysis difficult at best. An additional complication is that some of the potential outgroups are certainly paraphyletic and possibly even polyphyletic as presently defined, e.g., *Dialictus*, *Evylaeus.* A rigorous study of *Lasioglossum* phylogeny and biogeography is planned after a monograph of New World *Evylaeus* is completed. The present section is intended to provide an introductory basis for these future cladistic studies.

Of the 90 characters utilized for descriptive purposes, only 48 could be confidently coded


ZONULUM
LEUCOZONIUM
TITUSI
FUSCIPENNE
OLYMPIAE
SISYMBRII
PACIFICUM
TIMBERLAKEI
PAVONOTUM
ATHABASCENSE
HETERORHINUM
LAMPRONOTUM
ANHYPOPS
8
12
57b
57b
57a
68
68
80a: ACARINARIUM PRESENT
2
4
7
57a: MESOSCUTUM GRANULOSOPUNCTATE
83d: S.V LATERAL TUFTS
85c
87b
77a: SCOPAL HAIR COLOR DIFFERENTIATED
84: S.VII REDUCED
3
68: CLYPEUS DARK
86b: GONOBASE RIM
88: RETRORSE LOBE REDUCED
6
85b,c: S.VIII SHORT, ROUNDED
5
10: MALE CLYPEUS FLAT
1

67


CORIACEUM
COLATUM
TRIZONATUM
EGREGIUM
MELLIPES
CHANNELENSE
MORRILLI
ACUMINATUM
FORBESII
PARAFORBESII
DESERTUM
JUBATUM
PALLICORNE
57b
77a
11
57a: MESOSCUTUM GRANULOSOPUNCTATE
77a: SCOPAL HAIR COLOR DIFFERENTIATED
10
80b: ACARINARIUM LARGE
9
85c: S VIII ELONGATE
8

68

FIGURES 67, 68.—Preliminary cladogram for New World *Lasioglossum* with known males (see text for details).

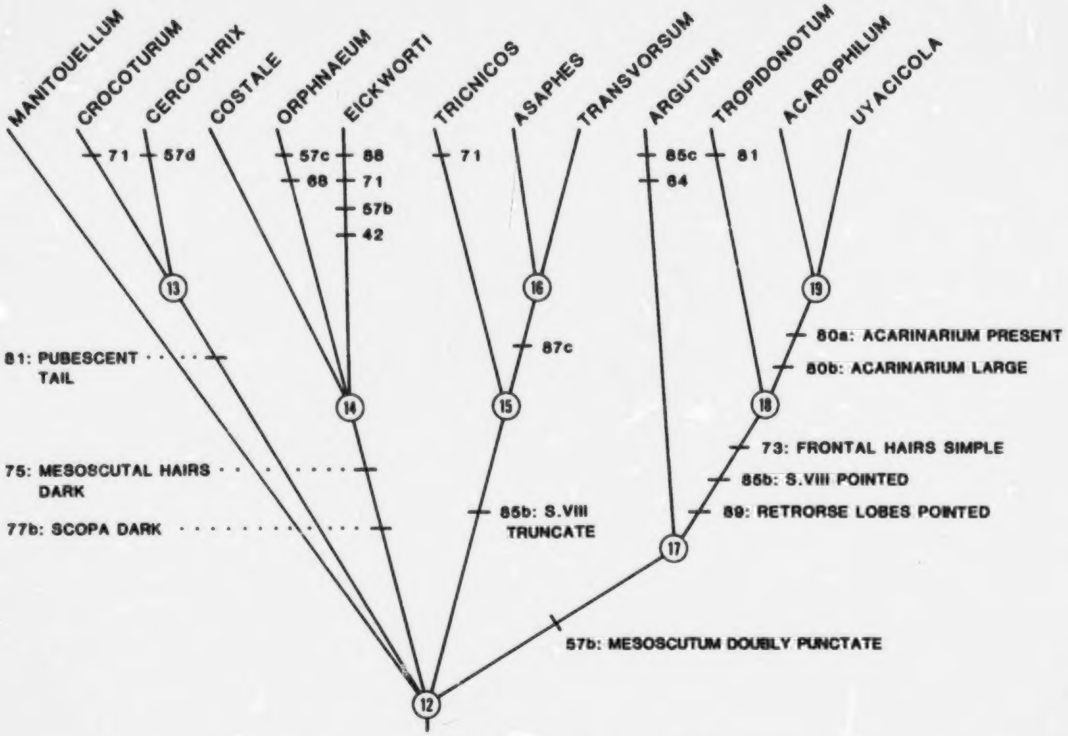

MANITOUELLUM
CROCOTURUM
CERCOTHRIX
COSTALE
ORPHNAEUM
EICKWORTI
TRICNICOS
ASAPHES
TRANSVORSUM
ARGUTUM
TROPIDONOTUM
ACAROPHILUM
UYACICOLA
71
57d
57c
68
88
71
57b
42
71
85c
64
81
13
16
19
80a: ACARINARIUM PRESENT
80b: ACARINARIUM LARGE
81: PUBESCENT TAIL
87c
14
15
18
73: FRONTAL HAIRS SIMPLE
75: MESOSCUTAL HAIRS DARK
85b: S.VIII POINTED
85b: S.VIII TRUNCATE
89: RETRORSE LOBES POINTED
77b: SCOPA DARK
17
57b: MESOSCUTUM DOUBLY PUNCTATE
12

FIGURE 69.—Continuation of cladogram in Figure 67 (see text).

into unambiguous character states. Also, certain details of punctuation and coloration were purposely ignored when intraspecific variability appeared to be great. The 48 characters having potential value in phylogenetic studies are listed below and discussed in relation to the cladogram presented in Figures 67–69. This cladogram is based on an analysis of 26 characters (indicated below with an asterisk) that are associated with what appear to be unique or near unique states within the Halictinae and therefore confidently polarized (apparent apomorphic character states are presented in small capital letters). Because of the great number of male characters involved, species for which males are still unknown were excluded from initial cladogram construction (possible relationships of these species are discussed below).

The cladogram was constructed with the aid of the PHYSYS program (copyright 1983 by J.S. Farris and M.F. Mickevich); a Wagner Ground-Plan Analysis was performed and the branch-swapping option utilized. In the following character listing, the first character number is that which is utilized throughout the text; the second number (in parentheses) corresponds to the associated matrix character number in Appendix 1.

1(1). Female body size: (1) small to moderate, under 9 mm; (2) conspicuously large, 9–12 mm. Among New World species, the conspicuously large body size is characteristic of *L. eickworti*, *L. katyae*, and *L. sandrae*.

4(47). Female head: (1) elongate; (2) conspicuously short. Head length varies considerably among species but may prove to be a difficult character to code for phylogenetic studies. Long heads are characteristic of nodes 2, 16, and 18; short heads support nodes 3, 7, 10, 14.

*8(2). Female supraclypeal area: (1) moderately protuberant, rounded; (2) STRONGLY PROTUBERANT, NARROWLY ROUNDED. The apomorphic state is found only in *L. eickworti*, *L. katyae* and *L. sandrae*.

*10(3). Male clypeal surface: (1) rounded; (2) FLATTENED. The flattened and highly polished male clypeal surface appears to be unique for most New World *Lasioglossum* species and strongly supports node 5. The clypeus of other male halictines is rounded and dull or distinctly punctate.

24a(4). Distal process of male labrum: (1) absent or weakly developed; (2) well developed.

24b(6). Distal process of male labrum: (1) at most, moderately projecting; (2) sharply projecting, needlelike.

26(6). Basal lateral depressions on male labrum: (1) absent; (2) present. These labral depressions are widespread throughout the genus but are especially common among Mexican species. Among species at node 12 the depressions are absent only in *L. transvorsum*.

27(7). Distal keel of female labrum: (1) narrow to moderately broad; (2) conspicuously wide, spatulate. The spatulate distal keel is found primarily among Mexican species and supports nodes 16, 10 (excluding *L. pallicorne*). It is also possessed by *L. argutum* and *L. bajaense*, a potential sister-species relationship indicated by other characters.

28(8). Distal lateral projections of female labrum: (1) present; (2) absent or greatly reduced. The reduction to near absence of the distal lateral projections is characteristic of the species at node 3 and *L. fuscipenne* and *L. orphnaeum* (it is also reduced in *L. aequatum*, *L. circinatum*, *L. tropidonotum*, and *L. xyriotropis*).

30(9). Male mandible: (1) short, obviously shorter than distance to opposing clypeal angle; (2) subequal to distance to opposing clypeal angle; (3) elongate, obviously exceeding distance to opposing clypeal angle. Extremely short mandibles are found among node 3 species as well as *L. pavonotum*. Conspicuously elongate mandibles are found throughout the genus, including *L. orphnaeum*, *L. eickworti*, and node 7 species.

32(10). Pronotal lateral angle: (1) obtuse, weakly projecting; (2) acute, sharply projecting. The sharply projecting pronotal angle is found in *L. eickworti*, *L. katyae*, and *L. sandrae*; *L. orphnaeum* and *L. perscabrum* (a sister-species relationship also suggested by character 57c), as well as *L. citerius* and *L. zonulum*.

33(11). Pronotal lateral ridge: (1) obviously interrupted by lateral sulcus; (2) complete or only inconspicuously interrupted. This character varies greatly among *Lasioglossum* species and within related potential outgroup genera. Among those species having a complete ridge are those at nodes 7 and 16; *L. orphnaeum* and *L. perscabrum*; *L. pallicorne* and *L. parkeri*.

34(12). Lower portion of pronotal lateral ridge: (1) sharply edged; (2) broadly rounded, inconspicuous. The broadly rounded lower ridge is found in all species below node 6. Among New World species this condition is found elsewhere only in *L. citerius* and *L. colatum*.

40(13). Dorsal propodeal surface: (1) longer than metanotum, subequal to scutellum in length; (2) conspicuously short, subequal to metanotum in length, shorter than scutellum. The very short propodeum is found in *L. leucozonium* and *L. zonulum* (node 2) and *L. titusi*.

*42(18). Dorsal propodeal surface: (1) rounded or truncated; (2) NARROWLY ROUNDED. The noticeably elongate and narrowly rounded propodeal surface is apparently unique to *L. eickworti*, *L. katyae*, and *L. sandrae*.

44(14). Lateral propodeal carinae: (1) weakly developed, not reaching dorsal propodeal surface; (2) well developed, reaching or very nearly reaching dorsal surface. Well-developed lateral carinae are highly correlated with a strongly sculptured propodeal surface, character 63. Strong carinae are present in all species below node 5 (excepting *L. titusi*, where they are still moderately developed and nearly reach the dorsal propodeal surface) as well as *L. aequatum*, *L. citerius*, *L. orphnaeum*, and *L. perscabrum*.

45(15). First major tooth of inner tibial spur: (1) at immediate base (distance from base subequal to length of first tooth); (2) intermediate in distance from spur base; (3) over one-third the length of the spur from spur base. Among New World *Lasioglossum*, the extreme basal positioning of the first spur tooth is found only at node 3; future study may show this to be an apomorphic condition. Also unusual is the extreme distal positioning of the first tooth found in *L. forbesii* (sensu lato), *L. morrilli*, *L. desertum*, *L. coriaceum*, *L. fuscipenne*, *L. argutum*, and at node 7.

*57a(16). Mesoscutal punctation: (1) punctures distinct, at least over posterior half; (2) GRANULOSO-PUNCTATE THROUGHOUT. The highly granuloso-punctate mesoscutum is found primarily among Mexican species, that is, all species at nodes 11 and 12 as well as *L. pavonotum*.

*57b(17). Mesoscutum: (1) not doubly-punctate; (2) DISTINCTLY DOUBLY-PUNCTATE. The doubly-punctate mesoscutum is found in species at node 17 as well as *L. colatum*, *L. eickworti*, *L. timberlakei*, and *L. titusi*.

*57c(18). Anterior portion of mesoscutum: (1) non-scabriculose; (2) SCABRICULOSE. The scabriculose anterior mesoscutal edge is apparently unique to *L. orphnaeum* and *L. perscabrum.*

*57d(19). Mesoscutal punctation: (1) fine; (2) moderately coarse; (3) CONSPICUOUSLY COARSE. Most New World species have fine mesoscutal punctation. The punctation is moderately coarse in *L. leucozonium* and *L. zonulum* and unusually coarse in *L. aequatum, L. cercothrix,* and *L. citerius.*

63(20). Dorsal propodeal surface: (1) ruguloso-striolate; (2) striolate; (3) strongly striate or reticulate; (4) smooth over posterior half. As mentioned above, the strongly sculptured propodeum is correlated with the strong development of lateral carinae. The smooth propodeal surface is found among species at node 17 as well as *L. bajaense, L. circinatum,* and *L. pharum* (all most likely form a natural grouping). Elsewhere a smooth propodeum is found in *L. coriaceum, L. pallicorne,* and *L. parkeri.*

*64(21). Posterior half of dorsal propodeal surface: (1) dull, either alveolated or variously sculptured; (2) POLISHED, SMOOTH AND SHINY. Among New World species, the polished propodeal surface is found only in *L. argutum* and *L. bajaense.*

*68(22). Male clypeal maculation: (1) present; (2) ABSENT. The clypeal maculation, usually present in male halictines, is absent in species at node 3, *L. orphnaeum, L. pavonotum,* and many specimens of *L. anhypops.*

*71(23). Forewing membrane: (1) uniformly pigmented, hyaline to lightly pigmented; (2) apex infuscated; (3) ANTERIOR HALF ALONG COSTAL MARGIN INFUSCATED. The infuscated apex is found among several Mexican species, whereas the highly unusual infuscated anterior margin is found in *L. crocoturum, L. eickworti, L. katyae, L. sandrae,* and *L. tricnicos.*

*73(24). Frontal hairs below ocelli: (1) plumose, similar to other facial hairs; (2) SIMPLE WITH RECURVED APICES. Simple, recurved frontal hairs are apparently found only among species at node 18 as well as in *L. circinatum* and *L. pharum.* This corroborates the pattern suggested by character 63 (smooth propodeal surface).

*75(25). Mesoscutal hairs: (1) white to pale orange; (2) BLACK. Dark mesoscutal hairs are found only among species at node 14 (including *L. katyae* and *L. sandrae*) and *L. citerius.*

*77a(26). Color of tibial hairs: (1) uniformly pale; (2) DIFFERENTIATED, WITH DARK HAIRS ON DORSAL SURFACE OR HAIRS ENTIRELY DARK. Differentiated scopal hair color is characteristic of Mexican species, found among all species at node 11 and 12 (suggesting *L. jubatum* and *L. pallicorne* are misplaced in the preliminary cladogram; also indicated by the entirely granuloso-punctate mesoscutum).

*77b(27). Tibial scopa: (1) with at least some pale hairs; (2) ENTIRELY DARK BROWN OR BLACK. Scopa having all dark hairs are found only in *L. eickworti, L. katyae, L. sandrae, L. orphnaeum, L. perscabrum,* and *L. costale.*

*80a(28). Acarinarium: (1) absent; (2) PRESENT. The acarinarium, apparently absent in Old World species, is present in all species at nodes 8, 19 as well as in *L. bajaense, L. bardum,* and *L. parkeri.*

*80b(29). Acarinarium: (1) absent to moderate in size; (2) CONSPICUOUSLY LARGE, CIRCULAR. A conspicuously large acarinarium is found at nodes 10, 19 and in *L. bajaense* and *L. bardum.*

80c(31). Acarinarium: (1) sharply defined by elongate fringe hairs; (2) indistinctly defined. The indistinctly defined acarinarium is found in *L. trizonatum* (sensu lato) and *L. colatum* at the base of node 8, possibly indicating a natural grouping. Given the extreme similarity of *L. anhypops* to other *trizonatum* forms, its lack of an acarinarium is presumed to be secondary.

*81(30). Terga IV–V of female: (1) with normal basal hair bands; (2) ENTIRELY PUBESCENT. The pubescent tail is found at node 13 and in *L. tropidonotum* and *L. sandrae.* This feature along with the infuscated anterior wing margins is presumably associated with polybiine mimicry and therefore possibly subject to homoplasy as indicated in the preliminary cladogram.

83a(32). Erect, lateral hair tufts on sternum V of male: (1) absent; (2) present.

83b(33). Adpressed hair fringes on posterior edge of male sternum V: (1) absent; (2) present.

83c(34). Sternum VI of male: (1) lacking distinctive hair patterns; (2) with well-formed, distinctive hair patterns. Among New World species, the vestiture on sternum VI is found only in *L. leucozonium* and *L. zonulum* (node 2).

*83d(35). Sternum V of male: (1) without elongate lateral hair tufts; (2) WITH ELONGATE LATERAL HAIR TUFTS. The apparently unique, elongate lateral hair tufts on sternum V provide a strong synapomorphy at node 4.

*84(39). Sternum VII of male: (1) well developed; (2) SLENDER, REDUCED. Among New World species, reduction of sternum VII is found only in *L. leucozonium* and *L. zonulum* (node 2).

85a(36). Median process of male sternum VIII: (1) present; (2) absent or extremely reduced. The absence of the sternal VIII median process is found in all species below node 5 corroborating the clypeal morphology pattern (character 10). The median process is also absent in *L. eickworti.*

*85b(37). Median process of sternum VIII: (1) rounded; (2) SHARPLY POINTED; (3) A TRUNCATED CONVEXITY AS SEEN IN VENTRAL VIEW. The sharply pointed median process is apparently unique to species at node 18; the unusual truncated condition is found only at node 15.

*85c(38). Median process of sternum VIII: (1) absent; (2) SHORT; (3) CONSPICUOUSLY ELONGATE. The very elongate median process is found only at node 9 and in *L. argutum*. Considering the short median process as part of an ordered sequence is tenuous at best and provides only very weak support for node 6.

86a(40). Gonobase: (1) short, approximately 0.5 the length of gonocoxite as seen in dorsal view; (2) moderate in length; (3) elongate, subequal to or slightly longer than gonocoxite. The conspicuously short gonobase is found at node 2, node 3 (excepting *L. pacificum*), and in *L. eickworti.* The very elongate gonobase is found primarily among Mexican species and supports node 18.

*86b(41). Conspicuous rim at apex of gonobase: (1) absent; (2) PRESENT. The unusual gonobase rim is apparently found only in species at node 3.

87a(44). Gonostylus: (1) hairy, with numerous elongate setae; (2) virtually hairless, with only very short, sparse setae. Among New World species, the virtually hairless gonostylus is found only at node 2 and in *L. titusi.*

*87b(45). Gonostylus: (1) without basal collar; (2) WITH BASAL COLLAR. The apparently unique gonostylar collar is found only at node 7.

*87c(46). Membranous lobe on inner apical surface of gonocoxite: (1) absent; (2) PRESENT. This membranous lobe is apparently found only in *L. asaphes* and *L. transvorsum* (node 16).

*88(42). Membranous retrorse lobe on ventral surface of genitalia: (1) well developed; (2) REDUCED; (3) absent. Among New World species the retrorse lobes are completely absent only in *L. leucozonium* and *L. zonulum* (node 2). Whether or not this is plesiomophic for the genus cannot be determined at present. The reductional state is most likely derived and supports node 3 and is also found in *L. eickworti.*

*89(43). Membranous retrorse lobe: (1) rounded distally; (2) SHARPLY POINTED DISTALLY. The sharply pointed retrorse lobes provide strong support for node 18.

The resolution of the derived cladogram is not high, as one would expect when clustering 39 taxa on the basis of only 26 characters. However, given the unique to nearly unique nature of the character states involved, the groupings obtained should be of some significance.

In Figure 67, the holarctic species, *L. leucozonium* and *L. zonulum* (node 2), form a distinct group that is clearly related to many Old World species. In addition to the unique reduction of the male seventh sternum, this group shares similarities in the following nonordered characters: 40, 57d, 83c, 86a, 87a. Also well supported is the group of species at node 3, all from the western United States and Mexico. Nonpolarized similarities associated with this group involve characters 28, 30, 45 and 86a. The enigmatic position of *L. fuscipenne* and *L. titusi* is clearly indicated. *Lasioglossum fuscipenne* females lack the labral distal projections (character 28) as do node 3 species but the significance of this similarity cannot be determined without study of other halictines.

A potentially significant finding is that the majority of New World *Lasioglossum* species (node 5) may comprise a monophyletic group. The males of all Old World *Lasioglossum* species examined have a rounded clypeal surface that is dull and/or conspicuously punctate (similar to that found in other halictine groups). The clypeus of most New World *Lasioglossum* males is nearly flat to slightly depressed, and polished with only obscure punctation. The clypeus of *L. eickworti* males is rounded and supposedly shows a reversal for this feature in the present analysis. Another interpretation, discussed below, is that this character supports the hypothesis that *L. eickworti, L. katyae,* and *L. sandrae* comprise a natural group (based on other characters) that is only distantly related to other New World species.

Lasioglossum pavonotum, the only metallic New World species, also has highly unusual male genitalia (Figures 592–595). While its obscure phylogenetic position is emphasized in Figure 67, the flat to slightly depressed male clypeus suggests that it belongs to a large New World species group. This species, along with *L. eickworti* and all other species below node 5, lack the well-developed median process of the eighth male sternum; however, the cladistic value of this similarity cannot be ascertained without further study of other halictine taxa. Consequently, the presence of a short, rounded median process provides only tenuous support at node 6 (conservatively, node 6 should drop to node 5).

Species at node 6 are distributed into three generalized groups. The first is an unresolved group comprised of *Lasioglossum athabascense*, node 7 (*L. heterorhinum*, *L. lampronotum*), and *L. anhypops*. These are species from the United States, i.e., species lacking the unusual characters associated with most Mexican species at node 12, that also lack an acarinarium typical of species grouped at node 8. Future work will most likely show some if not all of these species to be related to species in node 8. For example, *L. anhypops* lacks the acarinarium found in other *trizonatum* forms but otherwise both groups are virtually identical. The lack of an acarinarium in *L. anhypops* possibly represents a secondary loss, which can be determined only by further work.

All species at node 8 (Figure 68) are associated with mites and possess an acarinarium at the base of the first abdominal tergum. The naturalness of this grouping is open to question as it most likely excludes such species as *L. anhypops* (discussed above). Furthermore, the characters supporting node 11 are also characteristic of the Mexican species at node 12, suggesting that the placement of *L. jubatum* and *L. pallicorne* is problematic at best. Nevertheless, the unusually elongate median process of the male eighth sternum suggests some naturalness to the grouping at node 9. Interestingly, the species at the base of node 9 (*L. morrilli*, *L. forbesii*, sensu lato, *L. desertum*, as well as *L. coriaceum*) share the extreme distal placement of the first tibial spur tooth discussed in the treatment of character 45. At the base of node 8, *L. colatum*, the three *trizonatum* species, and *L. channelense* share the indistinctly formed acarinarial hair fringe, which may or may not have phylogenetic significance.

Most species from Mexico and Central America are grouped at node 12 (Figure 69). They are characterized by the densely granuloso-punctate mesoscutum and differentiated scopal hair coloration (as in Figure 1). This group may also include *L. jubatum* and *L. pallicorne* (node 11) as mentioned above. Within node 12 only two clades are strongly supported at present. Node 18 is extremely well supported by the sharply pointed median process of sternum VIII and the uniquely pointed retrorse genitalic lobes. The unusual simple and recurved frontal hairs supporting node 18 are also shared by *L. circinatum* and *L. pharum* (both Mexican species for which males are yet unknown). Species at node 15 all share the highly unusual median process of sternum VIII, a truncate, semicircular projection (Figure 285). Although the doubly-punctate mesoscutum is not unique to the species at node 17, this pattern is corroborated by the smooth propodeal dorsal surface found in the included species (both features are shared by *L. bajaense*, *L. circinatum*, and *L. pharum* indicating that they too belong here; a further relationship is suggested by *L. argutum* and *L. bajaense* having a uniquely polished dorsal propodal surface).

The relationships of other species included at node 12 remain obscure. Node 13 is only weakly supported by the pubescent abdominal apex (character 81), which also occurs in *L. sandrae* and *L. tropidonotum*. Although dark scopal and mesoscutal hairs (characters 75, 77b) are highly unusual in the genus and related groups, this support for the naturalness of node 14 remains unconvincing. In fact, *L. eickworti*, *L. katyae*, and *L. sandrae*, appear to comprise a natural taxon that may only be distantly related to most New World *Lasioglossum* (see "Remarks" section for *L. eickworti* for further details).

FLORAL ASSOCIATIONS

The *Lasioglossum* floral associations reported herein are based exclusively on specimen label data that does not differentiate between pollen- and nectar-gathering visits. While specimen label data were being recorded, those bees having noticeable pollen loads were noted and their numbers herein indicated parenthetically next to

TABLE 2.—Plant families with more than 35 records of visits by *Lasioglossum* (number of females with pollen loads given in parentheses).

Family	Genera Visited	No. of *Lasioglossum* visitors			
		Spp.	Individuals	Females	Males
COMPOSITAE	80	34	1978	1085(278)	893
ROSACEAE	22	23	515	487(158)	28
LEGUMINOSAE	19	22	476	297(55)	179
POLYGONACEAE	3	8	360	150(1)	60
CRUCIFERAE	20	20	339	338(95)	1
SALICACEAE	1	20	276	273(44)	3
HYDROPHYLLACEAE	6	15	129	118(47)	11
SCROPHULARIACEAE	9	17	122	121(37)	1
LABIATAE	12	12	101	81(32)	20
RANUNCULACEAE	6	16	85	79(4)	6
ERICACEAE	6	17	80	77(6)	3
ANACARDIACEAE	2	11	75	65(11)	10
UMBELLIFERAE	11	10	71	35(7)	36
ONAGRACEAE	6	9	63	58(36)	5
PAPAVERACEAE	3	5	61	61(13)	–
RHAMNACEAE	3	15	57	50(9)	7
MALVACEAE	6	5	50	46(14)	4
SOLANACEAE	4	8	49	48(6)	1
TAMARICACEAE	1	3	46	45(2)	1
LILIACEAE	10	8	42	39(20)	3
APOCYNACEAE	1	8	41	8	33
BORAGINACEAE	7	9	39	39(5)	–
All 74 families visited	317	39	5348	3983(880)	1365

the total number of specimens associated with a plant genus or family (a plant taxon associated with pollen-laden bees is preceded by an asterisk in the flower visitation listings for each *Lasioglossum* species). Although the actual source of pollen is not indicated by such records, they nevertheless provide some tenuous information on the subject. In general, specimen label data provide only limited information on floral associations but are here reported to summarize what data presently exist and to compare these with similar data reported for a group of long-tongued bees, the California Bombini (Thorp et al., 1983).

Of the total specimens of *Lasioglossum* examined, 5348 (21%) had associated floral data. The records were from 317 plant genera representing 74 families. Tables 2 and 3 list those families and genera having 35 or more *Lasioglossum* records (this is proportional to the 50-visit cut-off for the Bombini data reported by Thorp et al., in which there were a total of 7437 floral records). Of the 51 New World *Lasioglossum* species, 39 have associated floral data; nothing is known about the floral associations of 12 species from Mexico and Central America. An additional nine species occurring south of the Mexican border have six or fewer records. The floral summary for *Lasioglossum* is highly influenced by six species that account for 67% of the total records: *L. sisymbrii* (22%), *leucozonium* (15%), *paraforbesii* (8%), *titusi* (8%), *coriaceum* (8%), and *zonulum* (6%). The male records are highly influenced by two species, *L. leucozonium* (42%) and *sisymbrii* (15%).

Figure 70 plots the plant family visitation records reported by Thorp et al. (1983) for California Bombini with comparable data for *Lasioglossum* superimposed (note that this comparison will be highly influenced by the restriction of the Bombini records to the Californian flora, whereas the *Lasioglossum* records are not so lim-

TABLE 3.—Plant genera with more than 35 records of visits by *Lasioglossum* (number of females with pollen loads given in parentheses).

Genera	No. of *Lasioglossum* visitors			
	Spp.	Individuals	Females	Males
Solidago	12	347	55(21)	292
Salix	20	276	273(44)	3
Melilotus	12	249	116(10)	124
Prunus	12	175	172(64)	3
Eriogonum	6	167	148(1)	19
Erigeron	8	152	46(11)	106
Taraxacum	12	139	138(30)	1
Aster	13	135	24(2)	111
Hieracium	3	134	134(46)	–
Leontodon	3	91	15(7)	76
Phacelia	11	90	87(35)	3
Rubus	11	90	89(34)	1
Medicago	5	87	45(1)	42
Agoseris	4	86	86(10)	–
Brassica	14	81	81(30)	–
Ranunculus	11	78	72(3)	6
Penstemon	13	72	72(24)	–
Chrysothamnus	8	64	30	34
Rhus	11	63	54(10)	9
Hypochoeris	2	60	60(40)	–
Rosa	9	58	58(16)	–
Monarda	3	57	49(29)	8
Barbarea	7	53	53(13)	–
Potentilla	10	53	44(15)	9
Pyrus	5	51	44(1)	7
Ceanothus	12	49	45(9)	4
Sisymbrium	5	49	49(8)	–
Sonchus	4	47	39	8
Eschscholtzia	4	46	46(11)	–
Tamarix	3	46	45(2)	1
Helianthus	7	45	41(27)	4
Grindelia	7	42	16	26
Apocynum	8	41	8	33
Fagopyrum	1	41	1	40
Oenothera	3	40	40(30)	–
Daucus	4	39	3	36
Sphaeralcea	3	38	38(9)	–
Solanum	9	37	36(6)	1
Trifolium	10	37	34(5)	3

ited). The Compositae constitute 37% of all *Lasioglossum* floral records, which is similar to the 39% figure reported for the Bombini. This family appears to be especially important for *Lasioglossum* males, where it accounts for 65% of all records and is probably a reflection of the late summer and fall emergence of most males and their association with *Aster* and *Solidago*. Though the Compositae is the most commonly visited family by both *Lasioglossum* and Bombini, Figure 71 and Table 3 indicate that different plant genera are involved. The three plant genera most commonly visited by Californian Bombini are *Cirsium*, *Chrysothamnus*, and *Helianthus* (all composites) but appear to be infrequently visited by *Lasioglossum*. The primary composites reported for *Lasioglossum* are *Solidago* (6.5%), *Erigeron* (2.8%), *Taraxacum* (2.6%), *Aster* (2.5%), and *Hieracium* (2.5%).

The Leguminosae are much less important for *Lasioglossum* (8.9%) than for the Bombini (19%). *Lupinus*, *Trifolium*, and *Astragalus*, all important plants for the Bombini, appear to be relatively unimportant to *Lasioglossum* species; *Melilotus* is the only legume commonly visited by *Lasioglossum*. Unlike the Bombini, the Rosaceae constitute the second most important plant family recorded for *Lasioglossum* specimens with visits to *Prunus* (3.3%) and *Rubus* (1.7%) especially well represented. The Rosaceae is the most commonly visited family recorded for four *Lasioglossum* species: *L. athabascense*, *coriaceum*, *forbesii*, and *paraforbesii*. Two other families with open, short-corolla-type flowers are relatively more important for the short-tongued *Lasioglossum* than for the Bombini: Cruciferae (6.3%) and Polygonaceae (*Eriogonum*, 3.1%). *Salix* is the second most important plant genus associated with *Lasioglossum*, visited by 20 of the 39 bee species having floral data. This genus is relatively less important for *Bombus*, where *Salix* is visited only by early-spring foundress queens. The differences between the floral records for California Bombini and North American *Lasioglossum*, though highly influenced by differences in associated floras, possibly indicate that the short-tongued *Lasioglossum* species are more commonly associated with the open flowers of the Rosaceae and Cruciferae and are less commonly associated with the zygomorphic flowers of the Leguminosae and Labiatae, both important families for the long-tongued Bombini. Although the Compositae appears to be of primary and nearly equal importance to both groups of bees, different composite

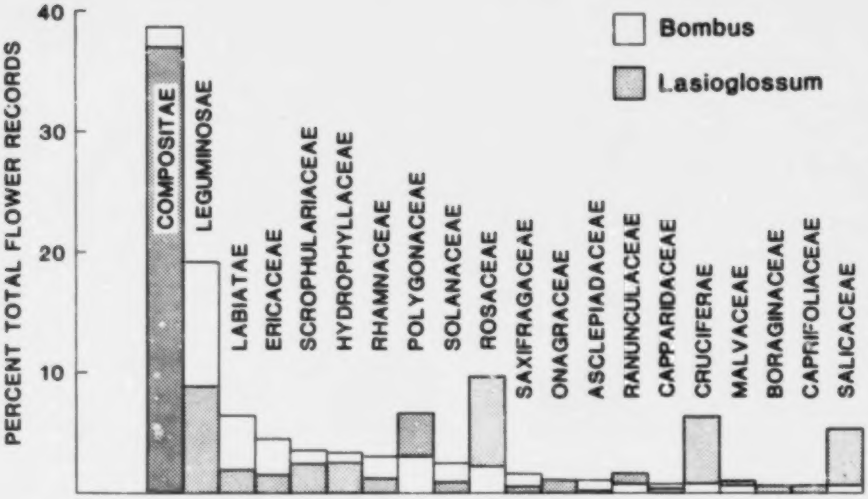


FIGURE 70.—Comparison of flower records (plant families) for New World *Lasioglossum* and California Bombini (Bombini data from Thorp et al., 1983).

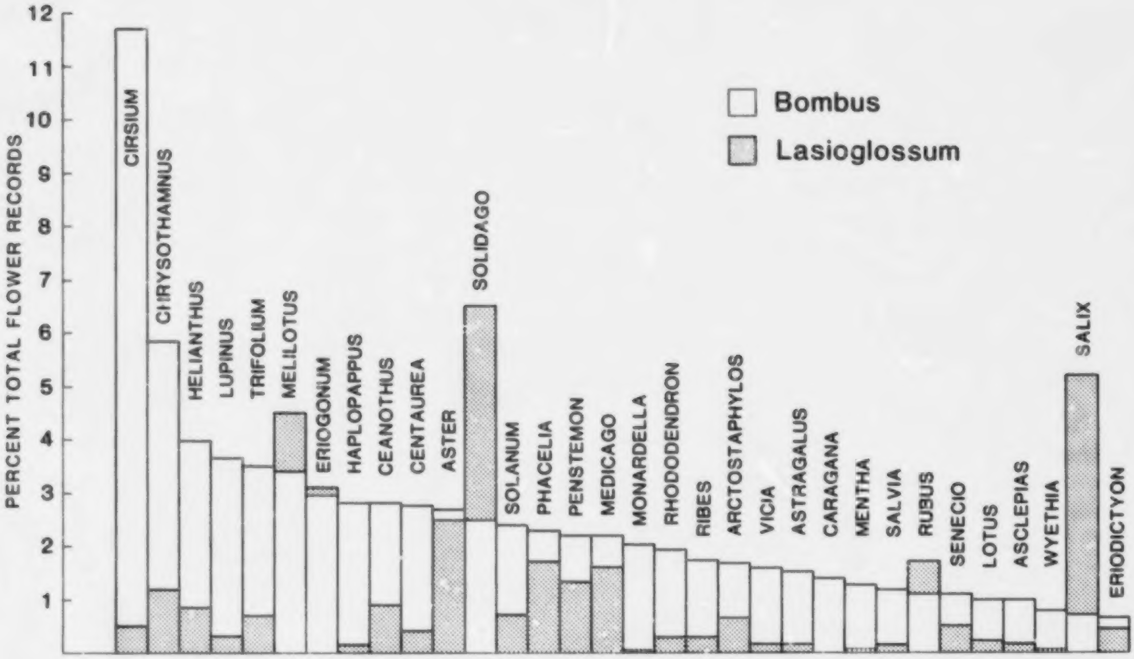


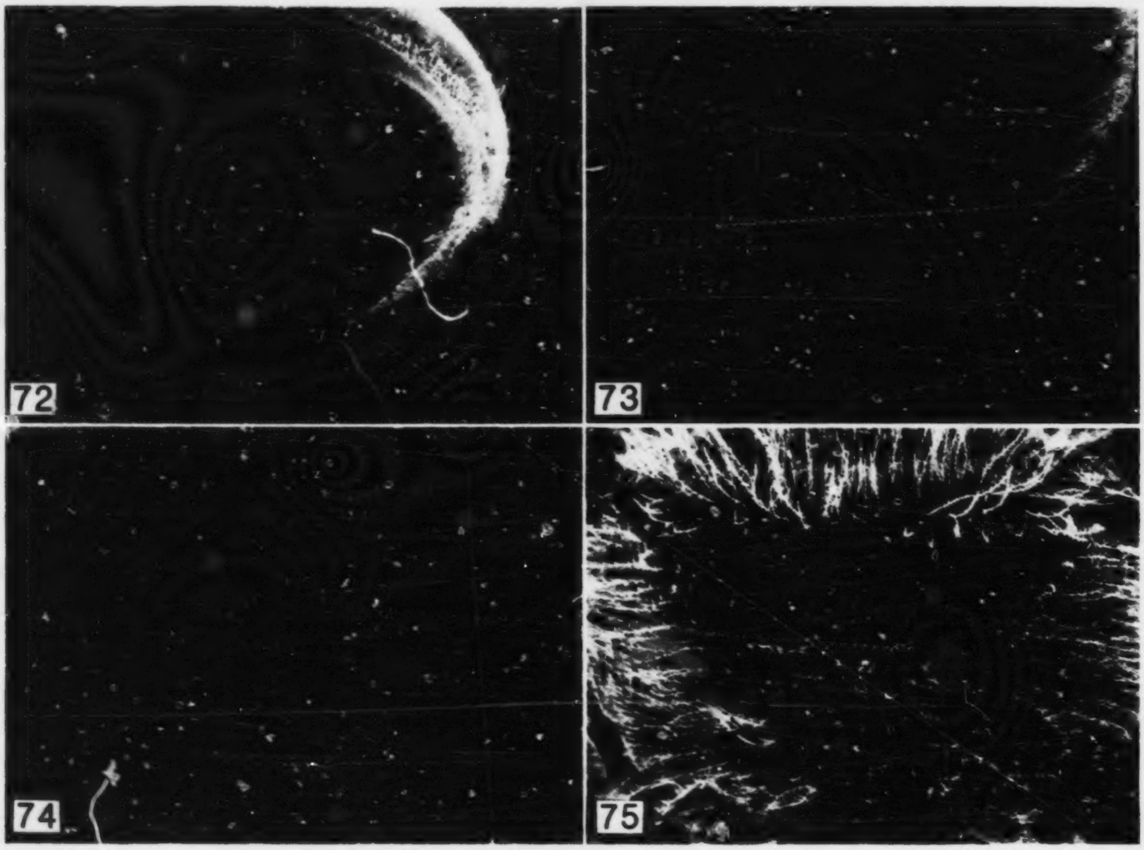
FIGURE 71.—Comparison of flower records (plant genera) for New World *Lasioglossum* and California Bombini.

genera are represented in known records for both bee taxa.

Lasioglossum flower records and a review of those females with noticeable pollen loads indicate that nearly all species are broadly polylectic. One exception is *L. titusi*, which is possibly broadly oligolectic, apparently collecting pollen only from the Compositae. *Lasioglossum leucozonium* records also indicate some preference for composite pollen, but this is less well supported than is the case for *L. titusi* oligolecty (see individual species accounts for further details).

MITE ASSOCIATIONS

As reviewed by Eickwort (1979), the association of many halictid bees with nest-inhabiting mites is one of the more interesting aspects of halictid biology. In most cases involving *Lasioglossum* species, deutonymphal mite hypopodes attach to an acarinarium on the anterior surface of the first abdominal segment of the developing female bee (Figure 72). The acarinarium often becomes completely filled by overlapping mites as in Figures 73, 74. After the bee emerges and begins provisioning its own nests, the phoretic mites transfer onto the provision masses in the new nest cells. Within the new cells the hypopodes complete their development into adults and the cycle repeats. To date, 15 genera in six families of mites have been associated with halictid bees. Biologies are equally variable and include forms that feed on fungi, pollen, and/or



FIGURES 72–75.—*Lasioglossum* species and phoretic mites: 72, *L. coriaceum* abdomen showing empty acarinarium; 73, *L. coriaceum* acarinarium with mites; 74, close-up of mites in acarinarium; 75, *L. titusi* with mites clinging to propodeal hairs.

surface fluids on the provision masses or larval bees.

While *Lasioglossum* specimens were being recorded for this study, it was noted whether or not individual bees had phoretic mites on them. The resulting data are presented in Table 4. Twenty-two of the 51 New World *Lasioglossum* species were associated with mites (I have not observed an acarinarium or mites on any Old World *Lasioglossum*, including the holarctic *L. leucozonium* and *L. zonulum*).

All of the mites associated with *Lasioglossum* belong to the family Histiostomatidae (previously Anoetidae), with the exception of ***Imparipes vulgaris*** Delfinado and Baker (Scutacaridae) associated with *L. titusi* (Linsley and MacSwain, 1959; Delfinado and Baker, 1976; Eickwort, 1979). The adult females of this species cling to the propodeal hairs of the female bee (Figure 75) and in cases of heavy infestation cling to hairs on other parts of the thorax, including the front coxae, and less commonly on the genae and anterior surface of the first metasomal tergum (the hairs on this surface are unusually elongate). This is quite different from the situation in *Lasioglossum* species associated with histiostomatid mites in which the hypopodes attach to an acarinarium on the anterior surface of the first tergum. Hypopodes on male *L. titusi* are also found on the propodeum and less commonly on the sides of the pronotum, differing from the usual positioning of mites on the venter of the thorax, the forecoxae, and the genae of males of other mite-associated *Lasioglossum* (a position that would presumedly facilitate the transfer of mites from male to female bees during copulation).

TABLE 4.—Number of *Lasioglossum* specimens, by species, associated with phoretic mites.

Species	Females		Males	
	No.	Percent	No.	Percent
L. ararophilum, new species	43	55.8	–	–
L. acuminatum, new species	111	49.1	26	19.4
L. anhypops, new species	15	2.7	–	–
L. argutum, new species	5	4.4	–	–
L. bardum (Cresson)	22	19.5	–	–
L. channelense, new species	92	69.7	53	32.9
L. colatum (Vachal)	17	6.8	–	–
L. coriaceum (Smith)	1356	75.9	283	43.1
L. desertum (Smith)	67	52.8	7	16.3
L. egregium (Vachal)	565	82.4	75	34.6
L. forbesii (Robertson)	94	63.9	13	26.5
L. jubatum (Vachal)	14	28.6	–	–
L. mellipes (Crawford)	397	72.6	43	45.3
L. morrilli (Cockerell)	47	77.0	1	20.0
L. pallicorne (Vachal)	13	81.2	20	60.6
L. paraforbesii, new species	645	68.1	12	10.9
L. parkeri, new species	1	100.0	–	–
L. pavonotum (Cockerell)	63	10.4	12	5.3
L. titusi (Crawford)	870	66.2	54	34.2
L. transvorsum (Vachal)	–	–	1	16.7
L. trizonatum (Cresson)	361	76.5	36	28.3
L. uyacicola (Cockerell)	2	15.4	–	–
L. xyriotropis, new species	1	14.3	–	–

Linsley and MacSwain (1959) reported that in a sample of 50 females of *L. titusi*, 45 (90%) carried hypopodes (reported as acarids). In this study, 1350 females from museum collections were examined and 870 (66.2%) had mites on them (34.2% of the males carried mites). The higher infestation reported by Linsley and MacSwain is probably better indicative of the true level of mite association among young females than are data from museum specimens. As females age they apparently lose most if not all of their phoretic hypopodes, presumably through transfer of the mites onto new provision masses. The lower infestation among museum specimens would reflect this age-attrition factor.

For most of the *Lasioglossum* species having well-developed acarinaria, the infestation levels of females range from a low of 49.1% (***L. acuminatum***) to over 80% (***L. egregium, L. pallicorne***). Species having lower infestation levels fall into three groups. First there is ***L. bardum, jubatum,*** and ***uyacicola,*** all of which have well-developed acarinaria but are known from so few specimens that comparative figures are virtually meaningless. The availability of more specimens would most likely reveal infestation levels comparable to the above species. In the second group, *L. colatum* and *pavonotum*, the acarinaria are very weakly developed (Figures 351, 591). Although the infestation levels are correspondingly low (6.8% and 10.4%), the males of both species also carry mites and the association of these bees with mites appears to be normal though relatively uncommon. In the third group the association with mites appears to be accidental: the acarinarium is entirely lacking and mites are only rarely found on female bees and never on males. For example, three species of the closely related *trizonatum* group have well-developed acarinaria and are usually associated with phoretic mites (infestation levels range from 72% to 82%). The fourth species of the *trizonatum* group, *L. anhypops*, lacks an acarinarium, and only 15 (2.7%) of the 613 females examined had mites on the first tergum (none of the 262 *L. anhypops* males carried mites). It is possible that the occurrence of mites on these females may be on account of transfer of hypopodes during attempted matings by infested males of other sympatric *trizonatum* species.

Samples of *Lasioglossum*-associated mites were removed and sent to B. OConner (University of Michigan) for further study and identification. It is hoped that a future publication will address what, if any, specificity exists between mite and *Lasioglossum* species and possible phylogenetic implications.

***Lasioglossum* Curtis**

Lasioglossum Curtis, 1833, folio 448 [type-species: *Melitta xanthopus* Kirby, by monotypy and original designation (= *Lasioglossum tricingulum* Curtis)].

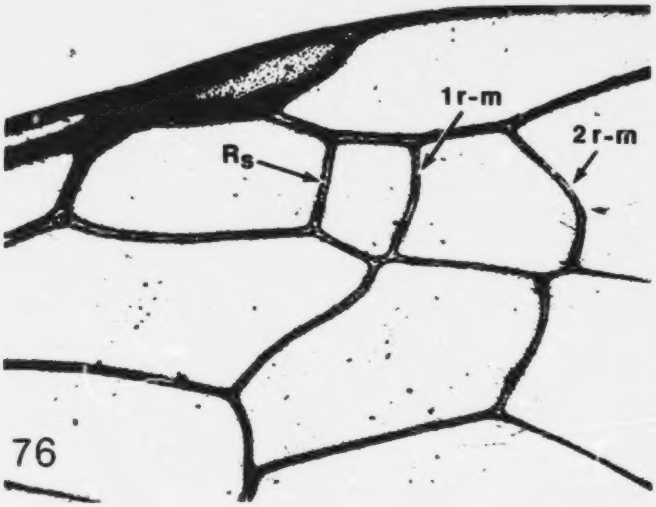
Curtisapis Robertson, 1918:91 [type-species: *Halictus coriaceus* Smith, by original designation].

DIAGNOSIS

Halictine bees can be recognized by the strongly arcuate basal vein (vein M) of the forewing (Figure 80). Among New World halictine females, the outer wing veins (2 r-m, 2 m-cu, Figure 76) are noticeably weakened only in species of *Lasioglossum*, sensu lato (includes *Dialictus*, *Evylaeus*, and the less common *Habralictellus*, *Hemihalictus*, *Paralictus*, and *Sphecodogastra;* see Michener, 1944:250). The basal hair bands on the abdominal terga (Figure 79) will also differentiate the above genera from the superficially similar *Halictus*, which have apical tergal hair bands (Figure 77) and well-developed distal wing veins (Figure 76).

Females of *Lasioglossum*, sensu stricto, differ from *Dialictus* and *Evylaeus* in having only the 2 r-m vein weakened (Figure 78), whereas the latter genera and related forms have vein 1 r-m also weakened (Figure 80). Furthermore, *Lasioglossum* (sensu stricto) females are relatively large bees (specimens examined in the present study ranged from 6.8 to 11.9 mm in length); most *Dialictus* and *Evylaeus* are only 4 to 7 mm long; however, a few *Evylaeus* are as large as 8 to 9 mm, e.g., *E. cinctipes* and *E. robustus*). In addition to the above venational difference and smaller size, the dull metallic coloration of the head and thorax will easily separate *Dialictus* from the normally black *Lasioglossum* (*L. pavonotum* is metallic blue-green but is a moderate-sized bee (7.3–9.1 mm, n = 15) occurring only along the Pacific coastline, Figure 583).

The above-mentioned venational differences are subtle among males and commonly results in confusion between *Lasioglossum* and *Evylaeus*. Males of the latter genus generally have relatively elongate antennae with the fourth antennal segment longer than segments 2 and 3 combined (Figure 82; fourth segment subequal to segments 2–3 in *Lasioglossum*, Figure 81). *Evylaeus* males having short antennae can usually be recognized by their relatively small body size, e.g., *E. glabriventris* (approximatey 4–5 mm in length). Another useful differentiating feature is clypeal shape: all New World *Evylaeus* males and only some *Lasioglossum* have a rounded, protuberant clypeal surface (Figure 445); however, most New World *Lasioglossum* males have a distinctively flattened to slightly depressed clypeal surface (Figure 435).



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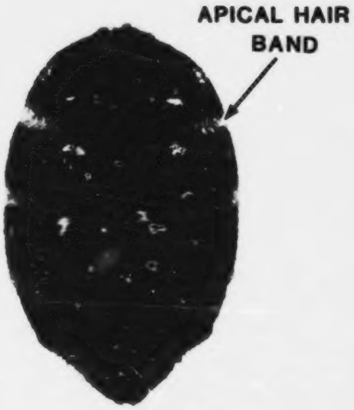
APICAL HAIR BAND

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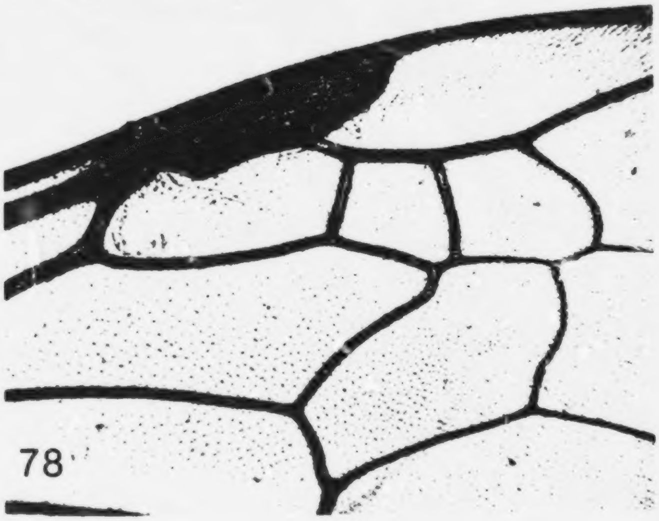

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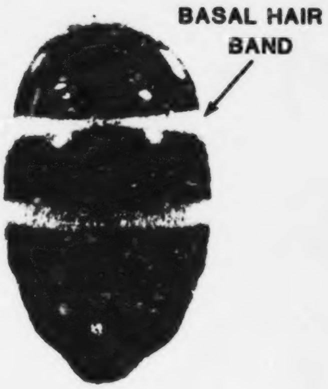
BASAL HAIR BAND

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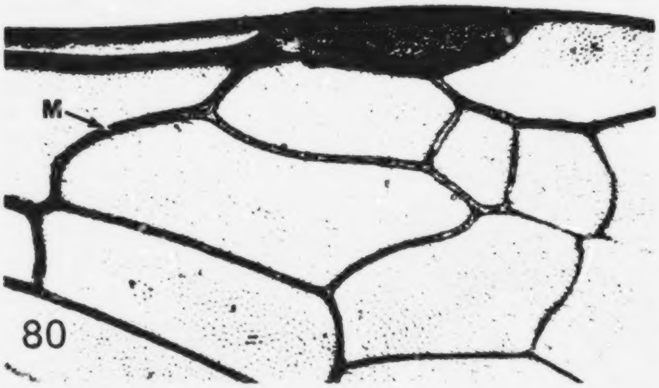

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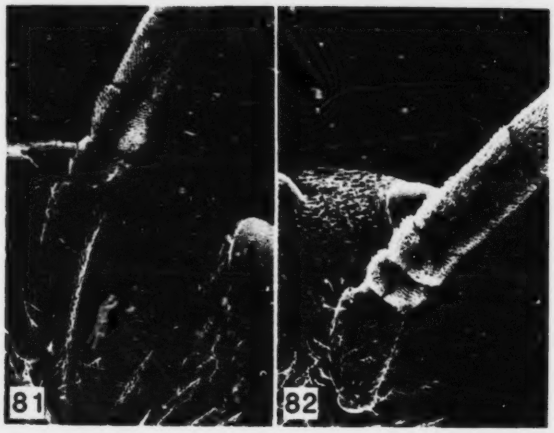
FIGURES 76–80.—Halictine diagnostic characters: 76, *Halictus rubicundus* forewing; 77, *H. rubicundus* abdomen; 78, *Lasioglossum paraforbesii* forewing; 79, *L. coriaceum* abdomen; 80, *Evylaeus quebecensis* forewing.

BEST CO



FIGURES 81, 82.—*Lasioglossum* and *Evylaeus* male antennae: 81, *L. coriaceum*, comparing length of antennal segments 2–3 to segment 4; 82, *Evylaeus* sp.

DESCRIPTION

In the following generic description, characters that vary considerably among New World *Lasioglossum* species are presented in capital and/or lowercase letters, with the range of character variation presented. Characters thought to be nonvariant for the treated species are given in small capital letters; however, some characters that vary in few species are also printed in small capitals, with the few exceptions listed parenthetically. The identifying character numbers are the same that are used in the species descriptions.

FEMALE.—(1) Length 6.8–11.9 mm; (2) wing length 1.9–3.4 mm; (3) abdominal width 1.8–3.5 mm.

Structure: (4) Head short to elongate; length/width ratio 0.74–1.04. (5) GENA SUBEQUAL TO EYE IN WIDTH, (6) ROUNDED POSTERIORLY, NOT PRODUCED OR ANGULATE. (7) Supraclypeal area evenly to narrowly rounded, (8) very weakly to strongly protuberant. (9) Clypeus projecting approximately 0.64 to all of its length below lower margin of eyes, (10) SURFACE USUALLY BROADLY ROUNDED (somewhat flattened dorsally in *L. titusi, L. athabascense;* slightly protuberant along ventral edge in *L. colatum;* with distinct semicircular depression on ventral edge in *L. sandrae*); (11) clypeal surface with or without median longitudinal sulcation. (12) FRONTAL CARINA USUALLY WELL DEVELOPED, EXTENDING AT MOST TO MIDPOINT BETWEEN ANTENNAE AND MEDIAN OCELLUS (very weakly developed in *L. pacificum, L. timberlakei*). (13) DISTANCE BETWEEN LATERAL OCELLUS AND EYE GREATER THAN DISTANCE BETWEEN LATERAL OCELLUS AND HIND MARGIN OF VERTEX (*L. zonulum* is the only exception in having these distances subequal or the latter distance exceeding the first); (14) distance between lateral ocelli exceeding, subequal to or exceeded by distance between lateral ocellus and eye; (15) LATERAL OCELLI JOINED ABOVE BY WEAK TO DISTINCT IMPRESSED LINE (apparently absent only in *L. uyacicola, L. circinatum, L. tropidonotum*). (16) COMPOUND EYES CONVERGING VERY SLIGHTLY BELOW. (17) HYPOSTOMAL CARINA WELL DEVELOPED AND UNIFORM (conspicuously developed in *L. fuscipenne*); (18) ANTERIOR ANGLE NARROWLY TO BROADLY ROUNDED, (20) ANTERIOR CARINA NEARLY PERPENDICULAR TO LONGITUDINAL CARINA (distinctly rounded and narrow in *L. zonulum*). (21) SCAPE REACHING TO TOP OF VERTEX; (22) PEDICEL SLIGHTLY LONGER THAN WIDE, SLIGHTLY LONGER THAN FLAGELLOMERE 1; (23) flagellomere 1 shorter than, subequal to, or longer than flagellomere 2. (24) LABRUM WITH BASAL AREA AND DISTAL PROCESS; (25) BASAL ELEVATION WELL DEVELOPED (weakly developed only in *L. pavonotum*); (26) BASAL LATERAL DEPRESSIONS ABSENT (present only in some males); (27) distal keel narrow, parallel-sided to very broad and spoon-shaped as seen in frontal view; (28) distal lateral projections conspicuously developed to absent; (29) fimbrial setae all acutely pointed or bluntly rounded distally. (30) MOUTHPARTS NOT UNUSUALLY MODIFIED OR ELONGATE; (31) MANDIBLE WITH DISTINCT SUBAPICAL TOOTH.

(32) Pronotal lateral angle broadly obtuse, narrowly obtuse, or forming a sharply pointed, projecting right angle; (33) pronotal lateral ridge complete or interrupted by oblique lateral sulcus; (34) lower portion of lateral ridge broadly rounded to sharply edged. (35) Mesoscutal lip

rounded to strongly bilobed, (36) strongly to very weakly elevated from pronotum; (37) **MEDIAN MESOSCUTAL LINE GENERALLY WEAKLY IMPRESSED TO ABOUT HALF LENGTH OF MESOSCUTUM** (very weakly impressed in *L. titusi;* extending beyond mesoscutal midpoint in *L. leucozonium, L. olympiae, L. pacificum, L. timberlakei, L. sisymbrii, L. zonulum*); (38) **PARAPSIDAL LINES ABOUT 0.29–0.43 LENGTH OF MESOSCUTUM.** (39) **MEDIAN SCUTELLAR IMPRESSION VERY WEAK** (absent in *L. leucozonium, L. zonulum, L. titusi, L. bajaense*). (40) Dorsal surface of propodeum about 0.53–0.95 the length of scutellum and slightly shorter than to 1.7 times the length of metanotum, (41) depressed or not depressed centrally, (42) posterior margin rounded to sharply truncated; (43) propodeal triangle inconspicuous to moderately well defined, median V-shaped area inconspicuous to strongly elevated, lateral rims of propodeal dorsal surface present or absent; (44) lateral carinae well developed and encircling posterior propodeal surface to weakly developed and extending no more than one-third distance of posterior surface. (45) Tibial spurs as in Figures 14–60.

(46) Lateral edge of metasomal tergum II straight to strongly sinuate.

Sculpture: (47) Face shiny or dull, (48) densely and usually contiguously punctate below ocelli, area between ocelli and antennae uniformly punctate or punctures becoming larger and less dense near antennae; frons of some Mexican species doubly-punctate. (49) **VERTEX DENSELY PUNCTATE NEAR EYE, PUNCTURES SEPARATED BY THEIR DIAMETER OR LESS** (vertex near eye of *L. titusi* highly polished, doubly-punctate, smaller punctures very fine, inconspicuous, separated by their width, larger noticeable punctures separated by about two times their width); (50) **VERTEX BEHIND OCELLI USUALLY OBSCURELY PUNCTATE WITH OBSCURE TRANSVERSE STRIATIONS** (striations conspicuous only in *L. leucozonium*). (51) Supraclypeal area polished, granulate or strigulate, (52) densely to sparsely punctate. (53) Clypeus polished or granulate; (54) punctation variable. (55) **HYPOSTOMA OBSCURELY STRIOLATE TO STRONGLY STRIATE, OFTEN POLISHED LATERALLY, PUNCTURES USUALLY OBSCURE AND SPARSE** (sculpture of this area shows high levels of intraspecific variation).

(56) Mesoscutum shiny or dull; (57) punctation variable, sparse to granuloso-punctate, doubly-punctate in some species. (58) Scutellar punctation variable, uniform and similar to that of mesoscutum or finer and less dense, often with very sparsely punctate to impunctate areas adjacent to median line. (59) **METANOTUM GRANULATE TO RUGULOSE, PUNCTATION USUALLY OBSCURE.** (60) **PRE-EPISTERNUM USUALLY RUGULOSE** (rugose in *L. leucozonium, L. zonulum*); (61) **HYPOEPIMERAL AREA AND MESEPISTERNUM USUALLY RUGULOSE TO ROUGHLY STRIGULATE** (strigate in *L. leucozonium*, rugose in *L. zonulum*, granuloso-punctate in *L. crocoturum, L. tricnicos*), **USUALLY WITHOUT DISTINCT PUNCTURES** (present only in *L. crocoturum*); (62) **UPPER PORTION OF METEPISTERNUM USUALLY STRIGULATE, BECOMING GRANULATE BELOW** (entirely strigate in *L. fuscipenne, L. leucozonium, L. titusi, L. zonulum, L. pacificum,* and related species). (63) Dorsal surface of propodeum highly variable in sculpture: smooth, rugulose, ruguloso-striolate, striolate, striate or scabrous; (64) surface smooth or microscopically alveolated.

(65) Metasomal tergum I shiny to dull; (66) punctation moderately fine to extremely fine and obscure, punctation sparse (punctures up to four times their width apart) to granuloso-punctate.

Coloration: (67) **HEAD, THORAX, ABDOMEN USUALLY DARK BROWN TO BLACK** (metallic blue-green only in *L. pavonotum* with tints of metallic blue, purple, or red on mesoscutum and scutellum). (68) **CLYPEUS WITHOUT MACULATION** (maculation present or absent in males). (69) **FLAGELLUM ENTIRELY DARK** (ventral surface lightly pigmented in some males).

(70) **TEGULAE USUALLY LIGHT BROWN TO BLACK WITH TRANSPARENT ANTERIOR EDGE** (pale-translucent in *L. sisymbrii*). (71) Wing membrane hyaline, pale yellowish brown or pale orange; anterior edge and/or apex of forewing infuscated in some species; **WING VEINS AND STIGMA LIGHT**

TO DARK BROWN. (72) Legs usually dark brown to black (pale ferruginous in some forms of *L. fuscipenne, L. mellipes,* most forms of *L. lampronotum,* and all *L. channelense*).

Vestiture: (73) Pubescence of head between vertex and antennae usually plumose or with some inconspicuous hairs near ocelli (this area in *L. acarophilum, L. circinatum, L. tropidonotum, L. pharum,* and *L. uyacicola* is covered with simple, distally recurved hairs that contrast with the plumose hairs near antennae; hairs in *L. tropidonotum* conspicuously thick and pigmented); (74) hairs white to dark brown.

(75) Pubescence of thorax white to dark brown; (76) mesoscutal hairs sparse, simple, inconspicuous to dense and conspicuously plumose. (77) Hind tibial hairs concolorous (white to dark brown) or with color differentiated (dorsal hairs brown, contrasting with relatively pale lateral and/or ventral hairs).

(78) Anterior hairs of metasomal tergum I and (79) basal hair bands of terga II–IV white, yellowish white or yellow. (80) Acarinarium (glabrous area surrounded by elongate hair fringe) on anterior surface of tergum I present or absent. (81) Basal hair bands on terga II–IV usually present and covering basal one-third of tergum (variously reduced or lost; *L. sisymbrii* with basal hair band on tergum I; terga IV–V entirely covered by short hairs in *L. cercothrix, L. tropidonotum, L. crocoturum*).

MALE.—Similar to female except as follows: (1) length 6.2–10.1 mm; (2) wing length 1.6–2.9 mm; (3) abdominal width 1.6–2.9 mm.

Structure: (4) Head length/width ratio 0.76–1.09. (5) Gena narrower, subequal to, or broader than eye, (6) rounded to strongly produced posteriorly (with conspicuous angulate projection in *L. eickworti*). (10) Clypeal surface flat to broadly rounded, ventral edge often shallowly to deeply depressed. (23) FLAGELLOMERE 1 USUALLY SLIGHTLY MORE THAN HALF TO THREE-QUARTERS THE LENGTH OF FLAGELLOMERE 2 (ratio 1:2, approximately 0.53–0.75); flagellomere 1 unusually short in *L. sisymbrii* (0.45), relatively long in *L. titusi* (0.87), *L. asaphes* (0.90), *L. transvorsum* (0.91). (24) Distal process of labrum present or absent, at most developed into a flat, acute projection; (25) basal area of labrum depressed medially or evenly rounded; (26) basal lateral depressions present or absent; (27, 28) UNLIKE FEMALES, DISTAL KEEL AND DISTAL LATERAL PROJECTIONS ABSENT. (30) Mandible very short (not reaching opposing clypeal angle) to conspicuously elongate (reaching opposing mandibular base); (31) MANDIBLE SIMPLE, SUBAPICAL TOOTH ABSENT.

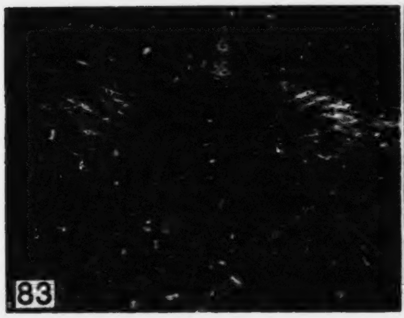
Vestiture: (82) Sterna IV and (83) V with variable vestiture, hairs forming erect tufts, fringes along posterior sternal edge or hairs inconspicuous.

Terminalia: (84) STERNUM VII SIMILARLY SHAPED IN MOST SPECIES (as in Figure 66; varying mostly in width of median process; somewhat reduced, slender in *L. leucozonium, L. zonulum*); (85) sternum VIII with or without median process, shape of process variable. (86) Gonobase short to elongate; (87) gonostylus variable in size and shape; (88) RETRORSE MEMBRANOUS LOBE USUALLY PRESENT (absent only in *L.leucozonium, L. zonulum*), (89) size and shape of lobe variable; (90) volsella variable in shape as illustrated, with or without prominent lateral lobe.

Key to *Lasioglossum* Females North of the Mexican Border

1. Head, thorax, and abdomen metallic blue-green; found along the immediate Pacific coastline [Figure 583] . . . . 34. ***L. pavonotum*** (Cockerell)
Head, thorax, and abdomen dark brown to black; distribution variable 2

2(1). Acarinarium (glabrous area surrounded by elongate hairs) present on anterior surface of tergum I [Figure 83] (acarinarium most weakly developed in *L. colatum* [Figure 84]) . . . 3
Acarinarium absent, elongate hairs scattered over anterior surface of tergum I [Figure 85] 17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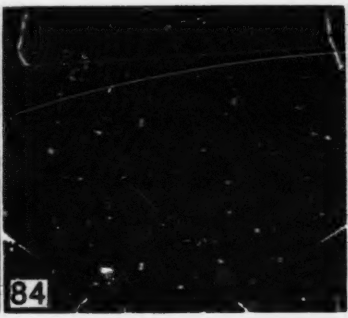
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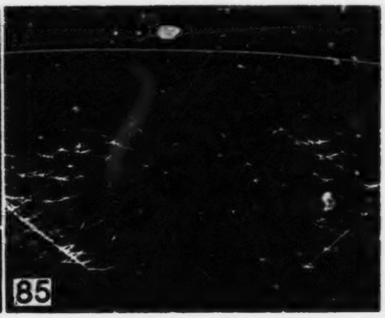
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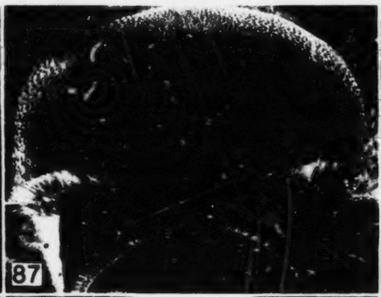
3(2). Acarinarium completely enclosed by circular fringe of elongate hairs [Figure 86]; anterior edge of mesoscutum indistinctly elevated from pronotum [Figure 87]; posterior half of propodeal dorsal surface conspicuously smooth [Figure 88]; lateral edge of tergum II strongly sinuate [Figure 64] . . . . 13. ***L. coriaceum*** (Smith)
Acarinarium with a narrow to broad, dorsal median opening [Figures 89, 95, 121]; anterior edge of mesoscutum distinctly elevated from pronotum [Figure 90]; posterior half of dorsal propodeal surface usually ruguloso-striolate [Figure 91, 110, 113] (conspicuously smooth only in *L. acarophilum* [Figure 250]); lateral edge of tergum II variable, straight to strongly sinuate 4

86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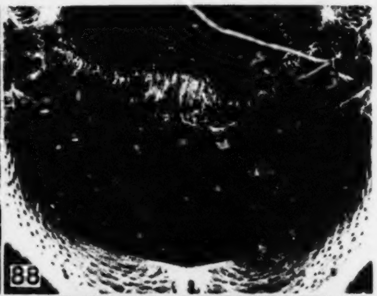
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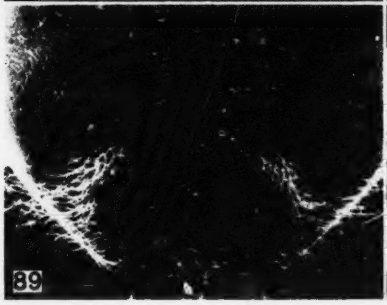
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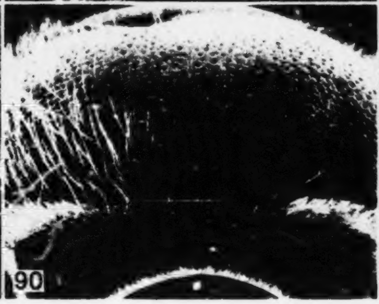
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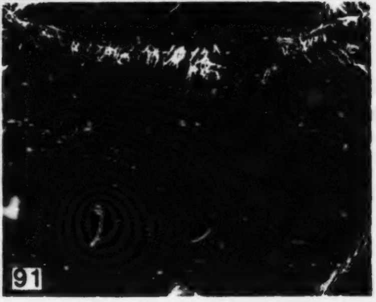
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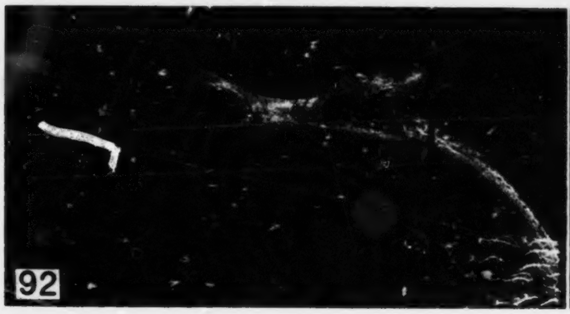
4(3). Dorsal acarinarial opening very narrow, opening distinctly narrower than width of lateral hair fringe as seen in dorsal view [Figure 92] 5
Dorsal acarinarial opening broad to very broad, opening as wide or wider than lateral hair fringe [Figure 93] 7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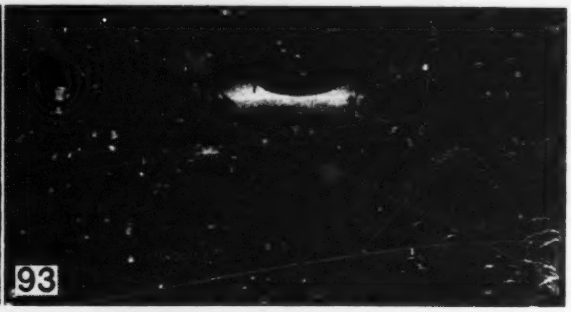
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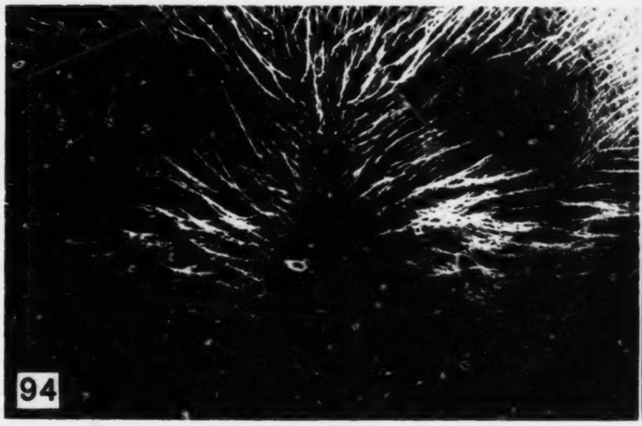
5(4). Glabrous surface of acarinarium arrowhead-shaped [Figure 94] . . . . 18. ***L. acuminatum*****,** new species
Glabrous surface of acarinarium circular [Figure 95] 6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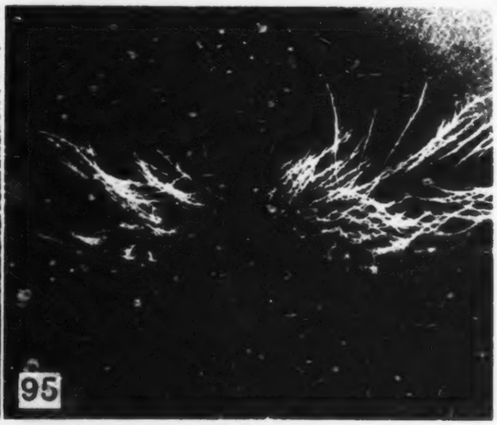
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6(5). Head rounded, appearing short [Figure 96]; apicolateral clypeal surface punctate; wing membrane yellowish; acarinarial fringe hairs extending laterally on tergum, forming extensive hair patch with distinct transverse dorsal margin [Figure 98]; eastern species, occurring west to Kansas and Oklahoma [Figure 406] . . . . . . 19. ***L. forbesii*** (Robertson)
Head narrowed ventrally, appearing moderately elongate [Figure 97]; apicolateral clypeal surface impunctate; wing membrane hyaline; acarinarial fringe hairs well developed only around circular glabrous surface, not forming a transverse dorsal hair margin [Figure 99]; found from central Texas to Arizona and northern Mexico [Figure 519] . . . . 28. ***L. morrilli*** (Cockerell)

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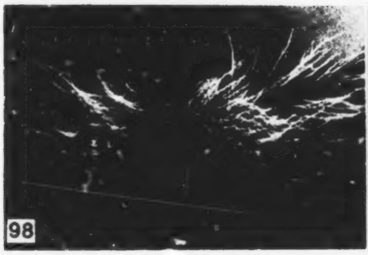
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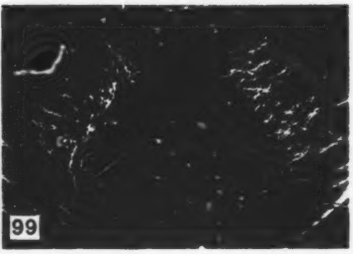
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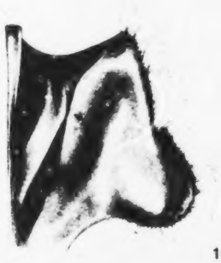
7(4). Pronotal lateral ridge virtually complete, only indistinctly interrupted by narrow, oblique sulcus [Figure 100]; punctures over anterior one-third of mesoscutum indistinct, interspaces obscured by scabriculous integument [Figure 324]; hind tibia and tarsus orange; known only from the Channel Islands of California ..... 9. ***L. channelense***, new species

Pronotal lateral ridge distinctly interrupted by oblique lateral sulcus [Figure 101]; punctures distinct over anterior surface of mesoscutum, integument not scabriculous [Figures 344, 439]; hind tibia and tarsus variable in color, usually dark brown to black; species not found on the California Channel Islands 8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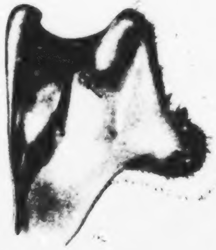
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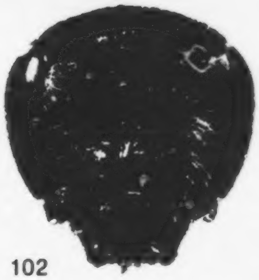
8(7). Acarinarium very weakly formed, with two large dorsal patches of short adpressed hairs [Figure 84]; erect acarinarial fringe hairs very sparse and inconspicuous [Figure 84] .... 12. ***L. colatum*** (Vachal)

Acarinarium moderately to strongly formed, with at most only small patches of adpressed hairs [Figure 83]; acarinarial fringe hairs conspicuous [Figure 83] 9

9(8). Head elongate, width at most subequal to length [Figures 102, 103] (length/width ratio generally over 0.90) 10

Head short to moderately short, width greater than length [Figures 104, 381] (length/width ratio generally under 0.90) 14



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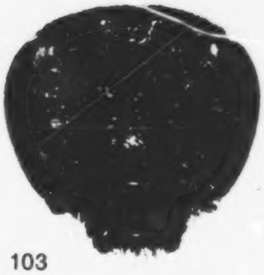

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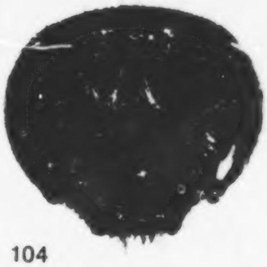
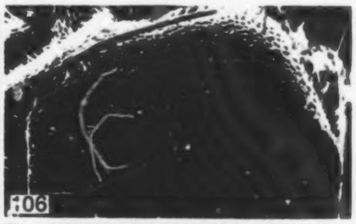


104

10(9). Mesoscutum appearing granuloso-punctate throughout, doubly-punctate [Figure 105]; posterior half of dorsal propodeal surface smooth [Figure 107]; acarinarium conspicuously large [Figure 247]; primarily a Mexican species, in the United States known only from Arizona (Cochise, Santa Cruz counties) . . . . 1. ***L. acarophilum*****,** new species

Mesoscutum at most appearing granuloso-punctate only along anterior edge, punctures separated by 1–2 times their width posteriorly [Figure 106]; posterior half of dorsal propodeal surface ruguloso-striolate [Figures 108, 113]; acarinarium moderately large [Figures 111, 114]; species found north of the Mexican border 11

105



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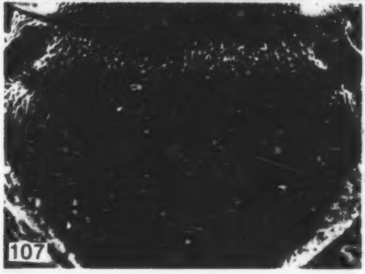

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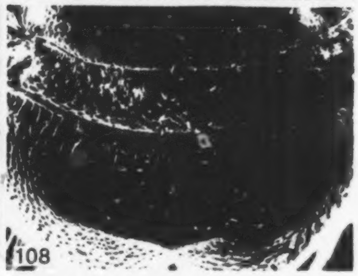
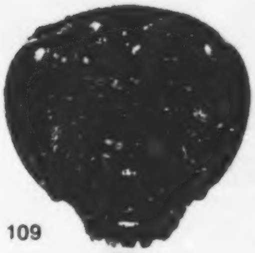


108

11(10). Head moderately elongate [Figure 109]; dorsal propodeal surface moderately elongate with slightly elevated posterior lateral rims [Figure 110]; acarinarial fringe hairs dense, sharply delimiting glabrous surface, dorsal opening with mat of short, adpressed hairs [Figure 111]; primarily from north-central states, west to Alberta, Idaho, Colorado, and Utah [Figure 406] . . . . 20. ***L. paraforbesii*****,** new species

Head elongate [Figure 112]; dorsal propodeal surface elongate, without elevated posterior lateral rims [Figure 113]; acarinarial fringe hairs sparse, only loosely delimiting glabrous surface, dorsal opening without adpressed hairs [Figure 114]; primarily from western states, east to the Dakotas, Colorado, and New Mexico [Figure 668] 12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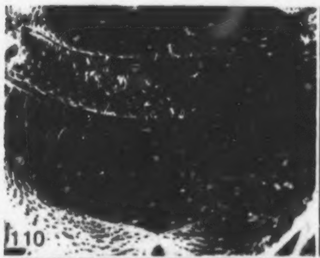
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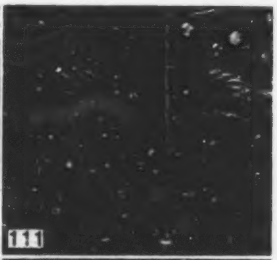
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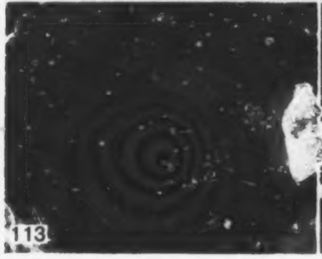
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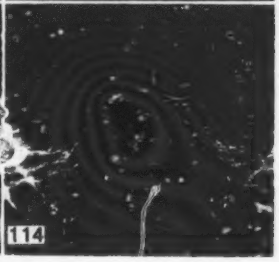
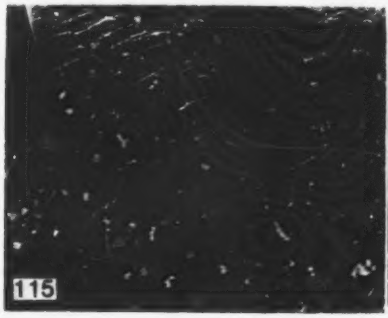

114

12(11). Lateral edge of tergum II strongly sinuate, often deeply excavated [Figure 115] . . . . 47. ***L. trizonatum*** (Cresson)

Lateral edge of tergum II virtually straight [Figure 116] or only moderately sinuate [Figure 117] 13

13(12). Lateral edge of tergum II virtually straight [Figure 116]; hind tibia and tarsus usually dark brown to black . . . . 45. ***L. egregium*** (Vachal)

Lateral edge of tergum II moderately sinuate (Figure 117); hind tibia and tarsus pale orange . . . . 46. ***L. mellipes*** (Crawford)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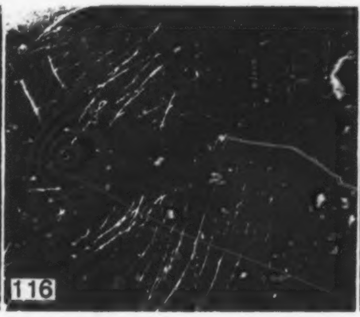
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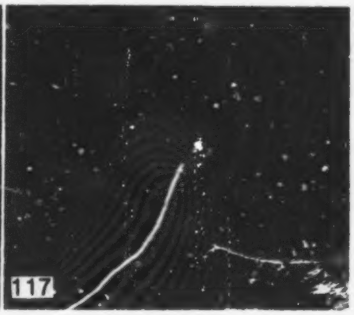
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14(9). Acarinarium moderately large, dorsal acarinarial opening subequal to width of lateral hair fringe as seen from above [Figure 111]; head moderately short [Figure 118] (length/width ratio generally over 0.90, $\bar{x} = 0.92$); wing membrane distinctly yellowish; primarily from north-central states, west to Alberta, Idaho, south to Utah, Colorado, and Kansas [Figure 406] . . . . 20. ***L. paraforbesii,*** new species

Acarinarium large, dorsal acarinarial opening usually wider than width of lateral hair fringe as seen from above [Figure 121] (opening subequal to lateral hair fringe in *L. bardum* where acarinarium is nevertheless larger than that of *L. paraforbesii* [Figure 120]); head conspicuously short [Figures 119, 381] (length/width ratio generally under 0.90, $\bar{x} =$ 0.87); wing membrane hyaline; primarily from the Rocky Mountain states, southwestern USA and Mexico [Figures 302, 472] 15

118

119

15(14). Mesoscutal hairs orange to pale orange, color sharply contrasting with pale pubescence of pleuron; primarily a Mexican species, in the United States known only from Cochise County, Arizona [Figure 472] .... 23. ***L. jubatum*** (Vachal)

Mesoscutal hairs white to pale yellowish brown, concolorous with pubescence of pleuron; species found from Montana south through Mexico [Figure 302] 16

16(15). Dorsal opening of acarinarium subequal to width of lateral hair fringe with hairs gradually becoming shorter medially [Figure 120]; dorsal propodeal surface ruguloso-striolate throughout [Figure 122]; species from central and eastern Texas [Figure 302] ....7. ***L. bardum*** (Cresson)

Dorsal opening of acarinarium wider than width of lateral hair fringe, hairs not becoming shorter medially [Figure 121]; dorsal propodeal surface weakly ruguloso-striolate with nearly smooth central area [Figure 123]; species from Montana, south to western Texas and Mexico [Figure 302] .... 16. ***L. desertum*** (Smith)

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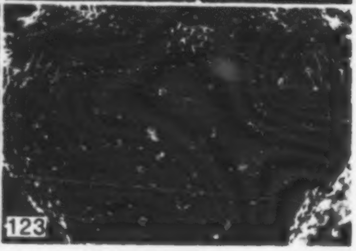
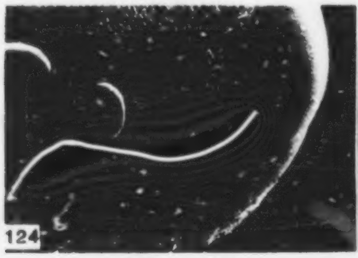


123

17(2). Terga II–IV impunctate; dorsal propodeal surface finely striolate over entire surface [Figure 126]; mesoscutal punctation very sparse, obscurely doubly-punctate with larger, noticeable punctures separated by 2–5 times their diameter [Figure 637]; vertex between compound eye and lateral ocellus nearly impunctate, conspicuously less punctate than upper frons [Figure 124]; mites, when present, clinging to propodeal hairs [Figure 75].. 41. ***L. titusi*** (Crawford)

Terga II–IV punctate; dorsal propodeal surface ruguloso-striolate [Figure 129] to conspicuously striate or reticulate [Figures 127, 130] (never finely and completely striolate as in [Figure 126]); mesoscutal punctation dense, punctures usually separated by their diameter or less (punctation obscure and sparse in *L. timberlakei* [Figure 622], but dorsal propodeal surface strongly striate. [Figures 623, 624]); vertex between compound eye and lateral ocellus punctate, punctation similar to that on upper frons [Figure 125]; mite hypopodes, when present, on anterior surface of tergum I 18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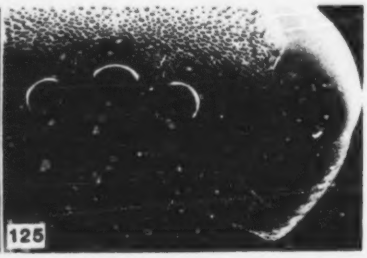
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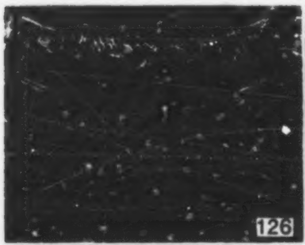
18(17). Lateral propodeal carinae well developed, reaching dorsal surface of propodeum [Figures 127, 128, 130]; dorsal propodeal surface usually strongly sculptured, conspicuously striate or rugose with striae or rugae reaching posterior margin of dorsal surface [Figures 127, 130] (if not strongly sculptured, lateral carinae very well developed and enclosing propodeal posterior surface as in [Figure 128]); pronotal lateral angle a sharply projecting right angle [Figure 131] or rounded and obtuse [Figure 537] 19

Lateral propodeal carinae weakly developed, not extending beyond midpoint of posterior propodeal surface [Figure 129]; dorsal propodeal surface finely ruguloso-striolate [Figures 129, 509]; pronotal lateral angle rounded, obtuse, never a sharply projecting right angle 25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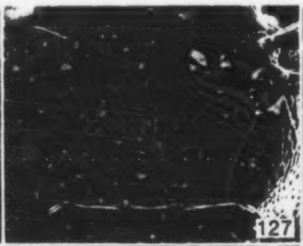
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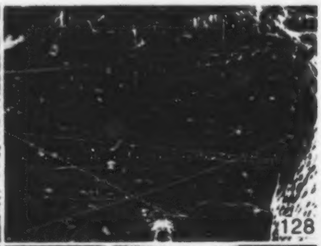
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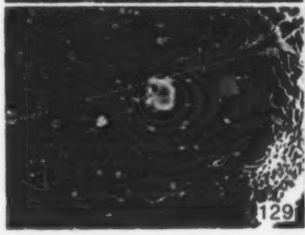
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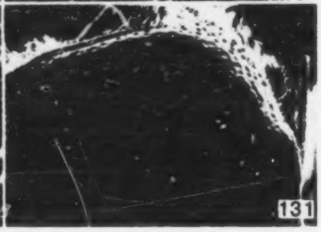
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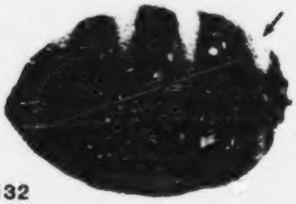
19(18). Dorsal surface of propodeum not strongly sculptured [Figure 128], most striae not reaching posterior margin of dorsal surface; lateral rims of propodeal triangle low but distinct, enclosing a ruguloso-striolate surface that sharply contrasts with smooth propodeal surface laterad of triangle [Figure 128]; mesoscutal punctation nearly uniform, most punctures separated by a distance greater than their diameter [Figure 131]; metasomal terga conspicuously cloudy, not polished; pronotal lateral angle a sharply projecting right angle [Figure 131]; a species of the eastern states, found west to Kansas and Oklahoma [Figure 443] . . . . 21. ***L. fuscipenne*** (Smith)

Dorsal propodeal surface strongly sculptured [Figures 127, 130], striae and rugae reaching posterior margin of dorsal surface; propodeal triangle weakly defined, surface inside and laterad of triangle not contrasting in sculpture; mesoscutal punctation noticeably more dense anteriorly with most punctures separated by the width of their diameter or less [Figures 613, 739] (punctures obscurely formed in *L. timberlakei* [Figure 622]); metasomal terga polished; pronotal lateral angle a sharply projecting right angle or rounded and obtuse 20

20(19). Tergum I with complete basal hair band, hairs white, short and adpressed [Figure 132]; tegulae translucent, yellow; a western species, found east to Colorado and Texas [Figure 607] . . . . 39. ***L. sisymbrii*** (Cockerell)

Tergum I without basal hair band [Figure 133]; tegulae brown (yellowish brown in some specimens of *L. timberlakei*) 21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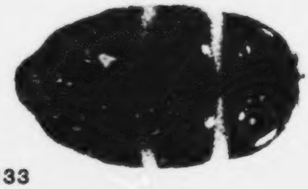
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21(20). Head elongate [Figures 134, 734] (length/width ratio 0.88–1.0, $\bar{x} = 0.93$); dorsal propodeal surface shorter than scutellum; mesoscutal punctation moderately coarse [Figures 136, 497]; eastern species occurring west in Canada to British Columbia [Figures 491, 733] 22

Head short [Figures 135, 555] (length/width ratio 0.77–0.89, $\bar{x} = 0.83$); dorsal propodeal surface subequal in length to scutellum; mesoscutal punctation relatively fine [Figures 137, 560, 622]; western species occurring north to southern British Columbia [Figures 531, 554] 23

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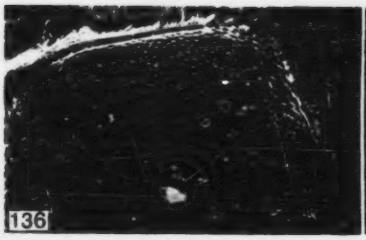
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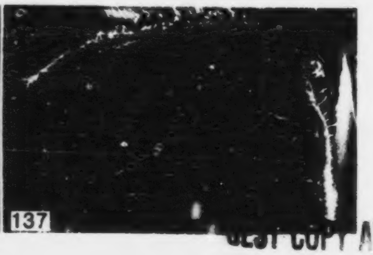
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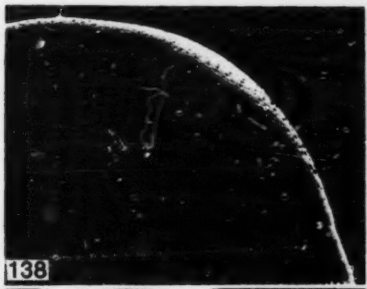
22(21). Punctation of tergum I very sparse centrally, many punctures separated by over 3–4 times their diameter [Figure 138]; surface of tergum I polished; vertex behind ocelli not transversely striated; pronotal lateral angle a strongly projecting right angle, [Figure 141] . . . . 51. ***L. zonulum*** (Smith)

Punctation of tergum I moderately dense centrally, punctures separated by 1–2 times their diameter [Figure 139]; surface of tergum I dull, granulate; vertex behind ocelli transversely striated [Figure 140]; pronotal lateral angle obtuse, weakly projecting [Figure 497] . . . . 26. ***L. leucozonium*** (Schrank)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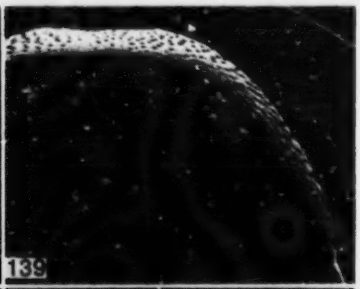
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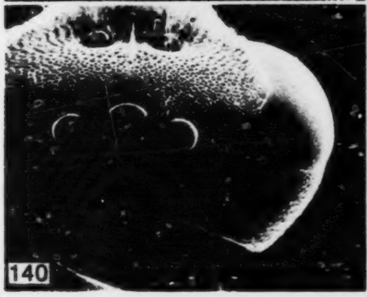
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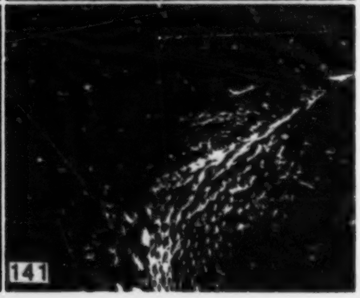
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23(21). Mesoscutal punctation obscurely developed, most punctures separated by 2–3 times their diameter and indistinctly formed [Figure 142]; posterolateral edge of mesoscutum with patch of short, dense hairs contrasting with other elongate mesoscutal hairs . . . . 40. ***L. timberlakei***, new species

Mesoscutal punctation well developed, punctures distinctly formed, most separated by their diameter or less [Figures 143, 560]; posterolateral edge of mesoscutum with elongate, moderately dense hairs similar to other mesoscutal hairs 24

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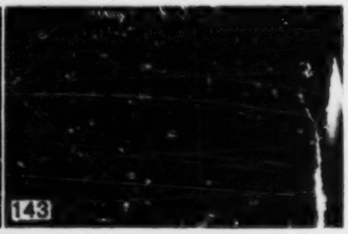
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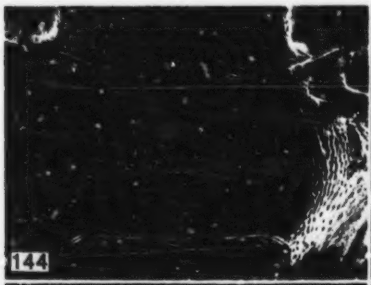
24(23). Posterior propodeal margin sharply truncated [Figure 144]; striae of dorsal propodeal surface dense [Figure 144]; surface immediately dorsoanteriad of middle coxa smooth, polished [Figure 146]; pubescence generally white . . . . 29. ***L. olympiae*** (Cockerell)

Posterior propodeal margin slightly bowed posteriad [Figure 145]; striae of dorsal propodeal surface relatively less dense [Figure 145]; surface immediately dorsoanteriad of middle coxa dull, striolate [Figure 147]; pubescence generally yellowish brown to golden .... 31. ***L. pacificum*** (Cockerell)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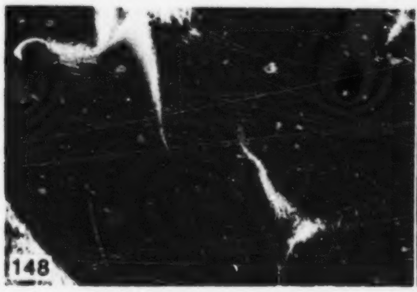
25(18). Pronotal lateral ridge complete, not interrupted by oblique lateral sulcus [Figure 148] .. 26
Pronotal lateral ridge incomplete, distinctly interrupted by oblique lateral sulcus [Figure 149] 27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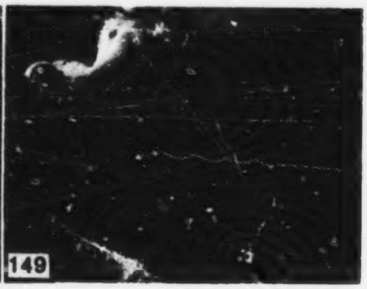
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26(25). Anterior half of mesoscutum dull, granuloso-punctate; basal half of clypeus conspicuously granulate, contrasting with polished apical half; wing membrane pale yellowish brown; hind tibia and tarsus brown .... 22. ***L. heterorhinum*** (Cockerell)
Anterior half of mesoscutum shiny, punctures dense but distinct; clypeus entirely polished; wing membrane hyaline; hind tibia and tarsus usually pale orange .... 25. ***L. lampronotum,*** new species

27(25). Mesoscutum coarsely granuloso-punctate throughout, punctures not noticeably separated on central portion of disc [Figure 150]; forewing apex infuscated [Figure 152]; basal abdominal hair bands yellowish white .... 27. ***L. manitouellum*** (Cockerell)
Mesoscutum not granuloso-punctate throughout, punctures separated at least by 1–2 times their diameter on central portion of disc [Figure 151]; forewing apex not infuscated [Figure 153]; basal abdominal hair bands white 28

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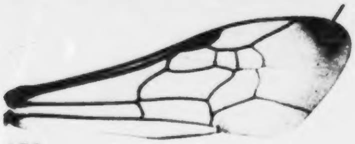
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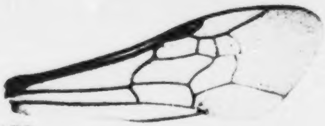
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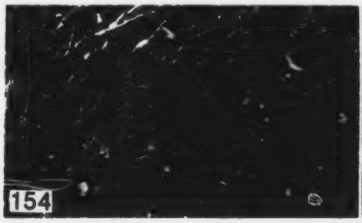
28(27). Lateral edge of tergum II very strongly sinuate, often sharply excavated [Figure 154]; head elongate [Figure 670] .... 44. ***L. anhypops*****,** new species

Lateral edge of tergum II weakly sinuate [Figure 155]; head short (similar to [Figure 545]) to moderately elongate [Figure 288] 29

29(28). Head short (similar to [Figure 545]); anterior half of mesoscutum granuloso-punctate, punctures contiguous; known only from Arizona, Colorado, and New Mexico [Figure 485] .... 37. ***L. rupticristum*****,** new species

Head moderately elongate [Figure 288]; anterior half of mesoscutum not granuloso-punctate, many punctures on central portion of anterior half separated by 1–2 times their diameter [Figure 293]; occurs in eastern states, Canada west to British Columbia, south to Colorado and Utah [Figure 287].......................... 5. ***L. athabascense*** (Sandhouse)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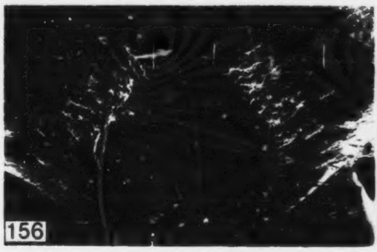
Key to *Lasioglossum* Females South of the Mexican Border

1. Acarinarium (glabrous area surrounded by elongate fringe hairs) present on anterior surface of tergum I [Figures 156, 157] 2

Acarinarium absent, elongate hairs scattered over anterior surface of tergum I [Figure 85] 9

2(1). Glabrous area of acarinarium relatively small [Figure 156] (one species with area conspicuously bilaterally depressed. [Figure 162]); dorsal opening of acarinarium absent [Figure 163] or very narrow (width of opening greatly exceeded by width of lateral hair fringe) [Figures 156, 162] 3

Glabrous area of acarinarium very large and circular, never bilaterally depressed [Figure 157]; dorsal opening of acarinarium broad, width subequal to or exceeding width of lateral hair fringe [Figure 157] 5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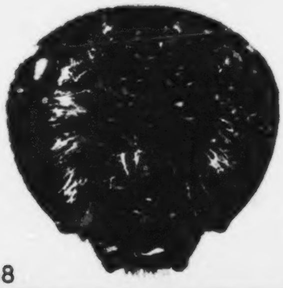
3(2). Head elongate [Figure 158]; pronotal lateral ridge incomplete, distinctly interrupted by oblique lateral sulcus [Figure 160]; posterior margin of dorsal propodeal surface rounded, without elevated rim [Figure 523]; mesoscutal pubescence white; from northern Mexico (Chihuahua, Durango, Nuevo Leon) [Figure 519] . . . . 28. ***L. morrilli*** (Cockerell)

Head short [Figure 159]; pronotal lateral ridge appearing complete, at most, minutely notched by oblique lateral sulcus [Figure 161]; posterior margin of dorsal propodeal surface defined by an elevated rim [Figure 574]; mesoscutal pubescence pale yellowish brown; species from central and southern Mexico [Figure 569] 4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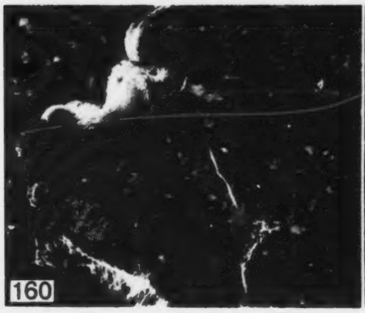
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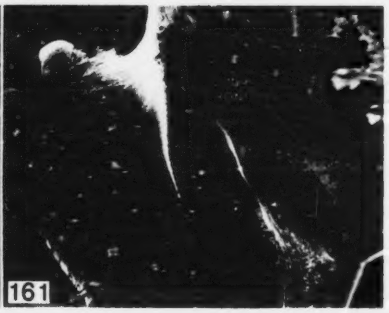
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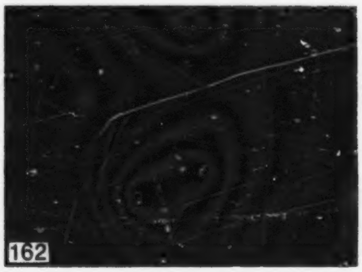
4(3). Acarinarium heart-shaped, glabrous area bilaterally depressed and enclosed laterally by a thick canopy of fringe hairs, narrow dorsal acarinarial opening present [Figure 162] .... 32. ***L. pallicorne*** (Vachal)

Acarinarium circular, glabrous area conspicuously depressed and entirely enclosed by elongate fringe hairs, dorsal acarinarial opening absent [Figure 163] .... 33. ***L. parkeri,*** new species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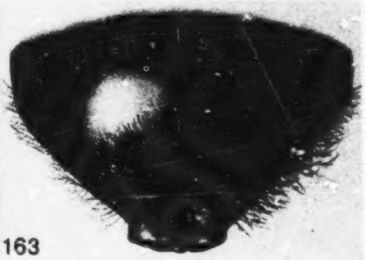
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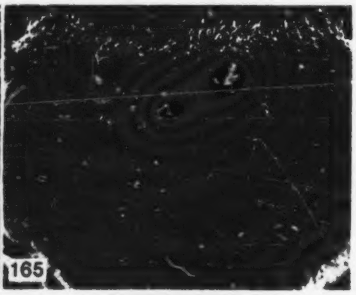
5(2). Posterior half of dorsal propodeal surface ruguloso-striolate [Figure 164] (rugulae of *L. desertum* often weakly developed but head conspicuously short); head short [Figure 166] 6

Posterior half of dorsal propodeal surface smooth, highly polished or alveolate [Figure 165]; head moderately elongate to elongate [Figure 167] 7

164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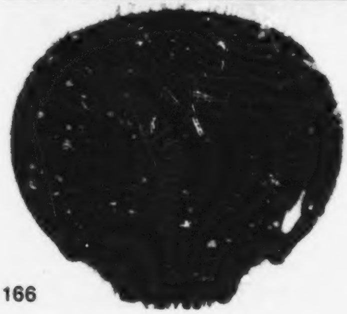
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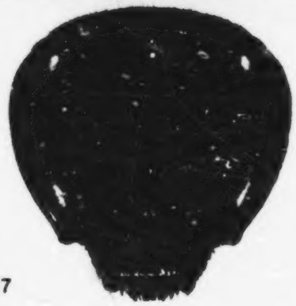

167

6(5). Mesoscutal pubescence orange to pale orange, sharply contrasting with white pubsecence of pleuron; pronotal lateral ridge nearly complete, very narrowly interrupted by oblique lateral sulcus (as in [Figure 9]) .... 23. ***L. jubatum*** (Vachal)

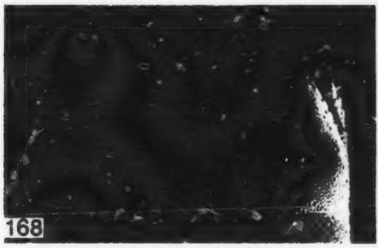
Mesoscutal pubescence white to yellowish white, concolorous with pubescence of pleuron; pronotal lateral ridge incomplete, obviously interrupted by oblique lateral sulcus (as in [Figure 10]) . . . . 16. ***L. desertum*** (Smith)

7(5). Posterior half of dorsal propodeal surface polished and shiny (as in [Figure 266]); supraclypeal area and basal half of clypeus shiny; from Baja California [Figure 300] . . . . 6. ***L. bajaense,*** new species

Posterior half of dorsal propodeal surface alveolate and dull [Figure 165]; supraclypeal area dull, conspicuously granulate; species not known to occur in Baja California [Figures 245, 372] 8

8(7). Mesoscutum appearing entirely granuloso-punctate, obscurely doubly-punctate (larger punctures more noticeable with SEM than with light microscope), smaller punctures relatively coarse and contiguous on anterior half of disc [Figure 168]; from southern Arizona south to Honduras [Figure 245] . . . . 1. ***L. acarophilum,*** new species

Mesoscutum noticeably doubly-punctate under light microscope, smaller punctures fine, separated by their diameter on anterior half of disc [Figure 169]; from Chiapas to Panama [Figure 372] . . . . 49. ***L. uyacicola*** (Cockerell)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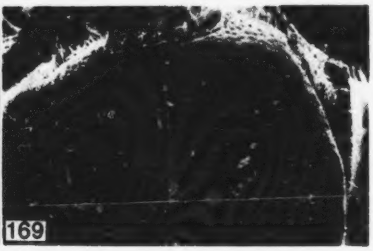
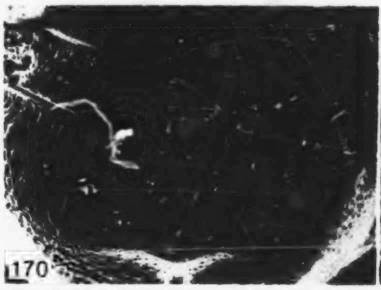

169

9(1). Posterior half of dorsal propodeal surface smooth, appearing dull (microscopically alveolated) or highly polished [Figure 170] 10

Posterior half of dorsal propodeal surface roughly granulate, ruguloso-striolate [Figure 171] to strongly sculptured [Figure 180] 13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171

10(9). Posterior half of dorsal propodeal surface highly polished, not alveolated [Figure 170]; head short [Figure 172]; pronotal lateral ridge complete (as in [Figure 9]) . . . . 3. ***L. argutum,*** new species

Posterior half of dorsal propodeal surface dull, microscopically alveolated [Figure 165]; head elongate [Figures 173, 601]; pronotal lateral ridge incomplete, distinctly interrupted by oblique lateral sulcus (as in [Figure 10]) 11

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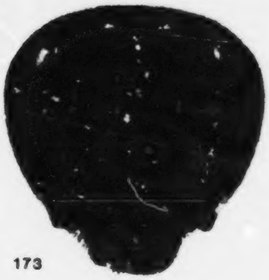
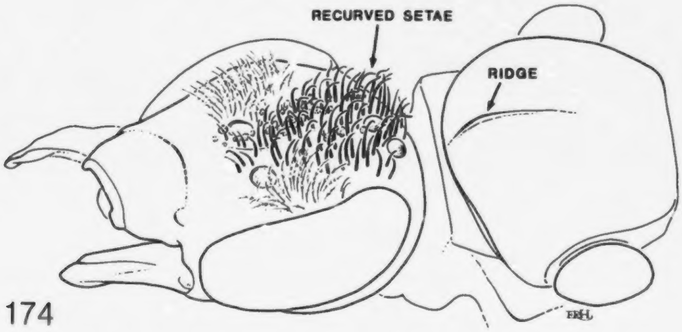

173

11(10). Mesoscutum with elevated median longitudinal ridge near anterior margin [Figure 174]; frons and vertex between lateral ocelli with thick, orange-brown, recurved setae [Figures 174, 723]; clypeus strongly protuberant [Figure 723]; terga IV–V nearly entirely covered by yellowish, short, adpressed pubescence . . . . 48. ***L. tropidonotum,*** new species

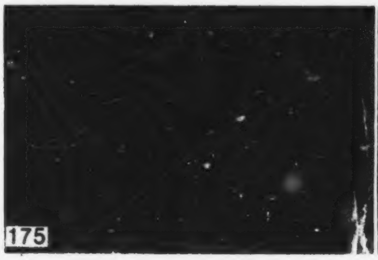
Mesoscutum without median longitudinal ridge; frons and vertex with simple pale hairs or with thin, inconspicuous orange-brown setae; clypeus not strongly protuberant; terga IV–V at most with usual basal hair bands 12



174

12(11). Mesoscutum appearing granuloso-punctate throughout as seen through light microscope, obscurely doubly-punctate with smaller punctures somewhat coarse and contiguous on anterior half of disc [Figure 175]; clypeus dull, conspicuously punctate with elevated, longitudinal rugulae . . . . 10. ***L. circinatum*** (Vachal)

Mesoscutum conspicuously doubly-punctate as seen through light microscope, smaller punctures on anterior half of disc fine, separated by their diameter or less but not contiguous [Figure 176]; clypeus shiny, moderately punctate, without longitudinal rugulae . . . . 36. ***L. pharum*** (Vachal)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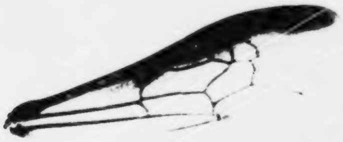
176

13(9). Anterior one-third of forewing along costal edge infuscated, contrasting with hyaline posterior two-thirds [Figure 177]; some species very large (body length: x̄ = 10.0–10.5 mm) with elongate, narrowly rounded dorsal propodeal surfaces 14

Anterior one-third of forewing not infuscated along costal edge, some species with infuscated apices [Figure 178] or with entire forewing orange; all smaller species (body length: x̄ = 7.5–9.6 mm) with relatively short, broadly rounded or posteriorly truncated dorsal propodeal surfaces [Figures 186, 187] (posterior margin acutely pointed in *L. transvorsum* [Figure 185]) 18



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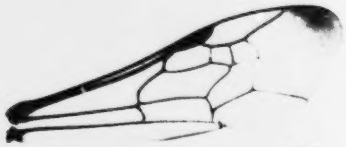

178

14(13). Tergum III with two transverse, pale pubescent hair bands [Figure 1] . . . . 15. ***L. crocoturum*** (Vachal)

Tergum III with usual basal hair band [Figures 132, 133] 15

15(14). Small species (body length 8.4–9.0 mm); anterior surface of tergum I with scattered, elongate hairs; pronotal lateral angle rounded, weakly projecting; upper portion of pronotal lateral ridge narrowly rounded, not carinate or flanged . . . . 43. ***L. tricnicos*** (Vachal)

Large species (body length 9.5–11.9 mm); anterior surface of tergum I with short, adpressed, laterally directed hairs; upper portion of pronotal lateral ridge strongly carinate and flanged near oblique lateral sulcus [Figure 405] 16

16(15). Mesoscutum covered with short, dense, nearly adpressed pubescence, hairs pale yellowish brown . . . . 38. ***L. sandrae*****,** new species

Mesoscutum with elongate, moderately sparse, erect pubescence, hairs dark brown to black 17

17(16). Mesoscutal punctation coarsely granuloso-punctate, punctures contiguous . . . . 17. ***L. eickworti*****,** new species

Mesoscutal punctation relatively fine and sparse, punctures separated by their diameter or slightly less, not contiguous . . . . 24. ***L. katyae*****,** new species

18(13). Tergum I with complete basal hair band [Figure 194]; tegulae translucent, yellow . . . . 39. ***L. sisymbrii*** (Cockerell)

Tergum I without basal hair band; tegulae brown 19

19(18). Dorsal propodeal surface strongly reticulate, appearing scabrous [Figure 179] or strongly striate with broad interspaces between striae [Figure 180]; anterior one-quarter of mesoscutum scabriculous [Figure 181]; pronotal lateral angle a sharply projecting right angle [Figure 181]; pronotal lateral ridge appearing superficially complete, minutely interrupted by oblique lateral sulcus [Figure 182]; mesoscutal hairs brown to dark brown 20

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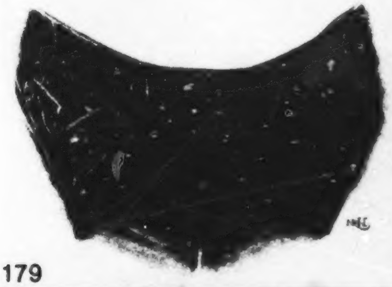
Dorsal propodeal surface ruguloso-striolate [Figures 185, 186] or finely striate, interspaces between striae not exceeding the width of individual striae [Figure 187]; anterior one-quarter of mesoscutum punctate to granuloso-punctate, not scabrolose; pronotal lateral angle obtuse, weakly projecting; pronotal lateral ridge variously developed; mesoscutal hairs usually pale yellowish brown (dark brown in some *L. costale* where the pronotal lateral ridge is obviously interrupted by oblique lateral sulcus as in [Figure 10]) 21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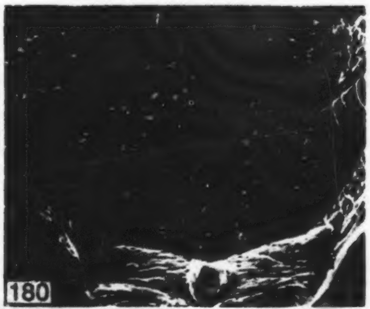
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182

20(19). Dorsal propodeal surface strongly reticulate, appearing scabrous [Figure 179] .... 35. ***L. perscabrum*****,** new species

Dorsal propodeal surface strongly striate with broad interspaces between striae [Figure 180] .... 30. ***L. orphnaeum*****,** new species

21(19). Pronotal lateral ridge appearing complete, not obviously interrupted by oblique lateral sulcus [Figures 11, 732]; head elongate [Figure 184] or short [Figure 183] 22

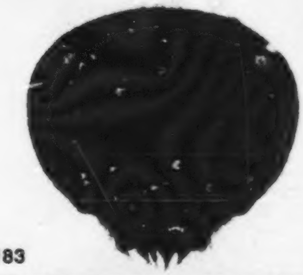
Pronotal lateral ridge incomplete, obviously interrupted by oblique lateral sulcus [Figure 10]; head short 24

22(21). Head short, appearing broader than long (as in [Figure 183]) .... 50. ***L. xyriotropis*****,** new species

Head elongate, appearing longer than broad [Figure 184] 23

23(22). Posterior margin of dorsal propodeal surface conspicuously "V-shaped" and elevated [Figure 185]; anterior surface of tergum I with patch of short, adpressed hairs.............. .... 42. ***L. transvorsum*** (Vachal)

Posterior margin of dorsal propodeal surface broadly rounded, not elevated [Figure 186]; anterior surface of tergum I with scattered, elongate hairs ... 4. ***L. asaphes*****,** new species



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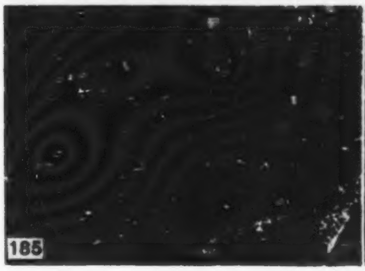

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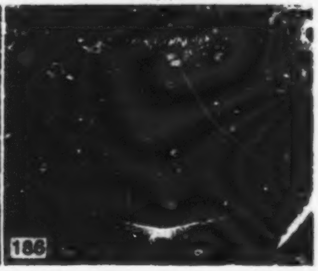


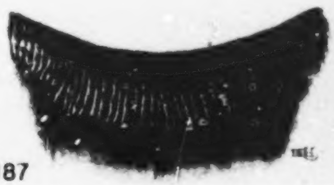
186

24(21). Terga IV–V entirely covered by pale, short, adpressed pubescence (as in [Figure 1]) . . . . 8. ***L. cercothrix,*** new species

Terga IV–V with usual basal hair bands 25

25(24). Dorsal propodeal surface conspicuously, finely striate, striae nearly linear and separated by regular interspaces subequal in width to striae [Figure 187]; lateral propodeal carinae well developed, reaching dorsal propodeal surface [Figure 187] . . . . 2. ***L. aequatum*** (Vachal)

Dorsal propodeal surface ruguloso-striolate, striae not linear or regularly spaced [Figure 188]; lateral propodeal carinae weakly developed, not reaching dorsal propodeal surface [Figure 188] 26



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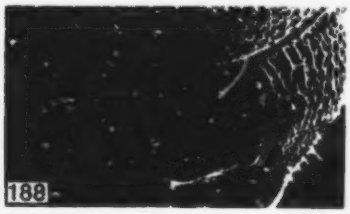

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26(25). Forewing mostly hyaline, apex infuscated [Figure 152]; mesoscutal hairs pale yellowish brown . . . . 27. ***L. manitouellum*** (Cockerell)

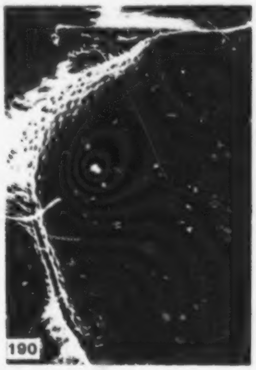
Forewing mostly pale orange, apex not noticeably infuscated; mesoscutal hairs pale yellowish brown to dark brown . . . . 14. ***L. costale*** (Vachal)

Key to *Lasioglossum* Males North of the Mexican Border

1. Head, thorax and abdomen metallic blue-green; found along the immediate Pacific coastline [Figure 583] . . . . 34. ***L. pavonotum*** (Cockerell)
Head, thorax and abdomen brown to black; distribution variable 2

2(1). Sterna II–IV densely covered on posterior half by short, adpressed hair patches [Figure 189]; pronotal lateral angle a sharply projecting right angle [Figure 190]; species of eastern United States, west to Kansas and Oklahoma [Figure 443] . . . . 21. ***L. fuscipenne*** (Smith)
Sterna II–IV without dense, adpressed hair patches; pronotal lateral angle variously developed, usually obtuse and weakly projecting 3

189



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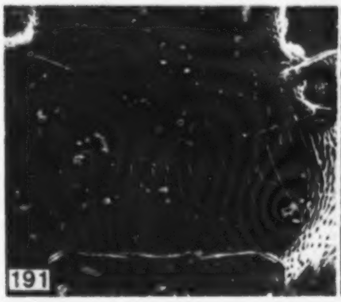
3(2). Dorsal surface of propodeum strongly sculptured, conspicuously reticulate or striate, well-developed rugulae and striae reaching posterior margin of dorsal surface [Figure 191]; sculpturing weakest in *L. titusi* where striae nevertheless reach posterior margin [Figure 192]); lateral carinae well developed, extending beyond midpoint of propodeal posterior surface, often reaching dorsal surface [Figures 191, 192] 4
Dorsal surface of propodeum weakly sculptured, ruguloso-striolate, rugulae and striae, at most, inconspicuously reaching posterior margin of dorsal surface ([Figure 193]; posterior edge of dorsal surface often smooth, shiny); lateral carinae weakly developed, not extending beyond midpoint of propodeal posterior surface [Figure 193] 10



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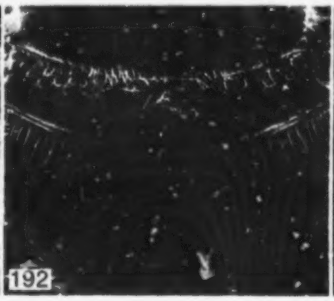

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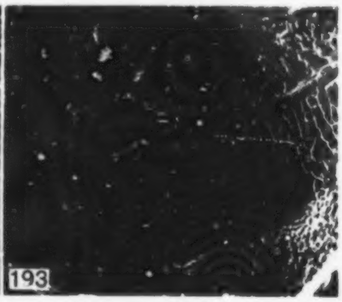

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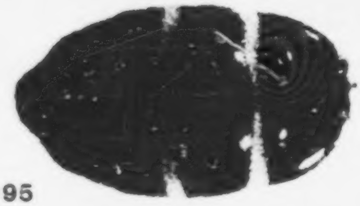
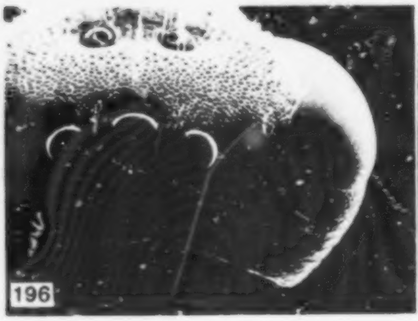
4(3). Tergum I with basal hair band [Figure 194]; tegulae translucent, yellow; western species, found east to Colorado and Texas [Figure 607] . . . . 39. ***L. sisymbrii*** (Cockerell)
Tergum I without basal hair band [Figure 195]; tegulae brown (yellowish brown in some specimens of *L. timberlakei*); distribution variable 5

194


195

5(4). Vertex between compound eye and lateral ocellus virtually impunctate, conspicuously less punctate than frons (as in [Figure 197]); vestiture on sternum V unmodified except for distinctive fringe of short hairs along posterior sternal edge [Figure 198]; hind tarsi yellow . . . . 41. ***L. titusi*** (Crawford)

Vertex between compound eye and lateral ocellus obviously punctate, at most, only slightly less punctate than frons (as in [Figure 196]); vestiture on sternum V not as above [Figures 201, 205]; tarsi dark brown or yellow 6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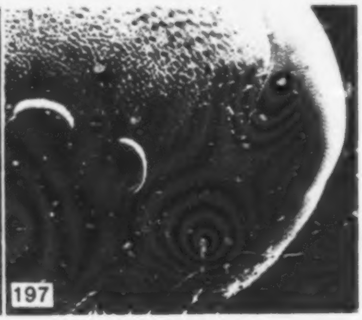
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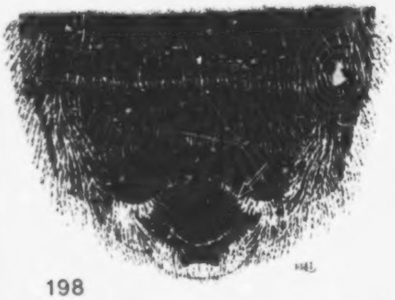
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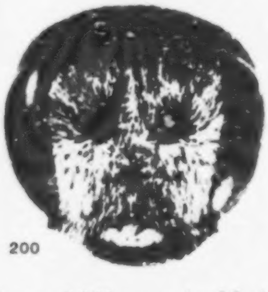
6(5). Sternum V with elongate, lateral hair tufts [Figures 201, 202]; clypeus entirely dark, lacking yellow maculation [Figure 199] 7

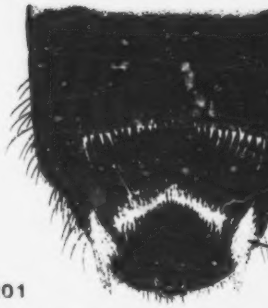
Sternum V without elongate, lateral hair tufts [Figures 203, 204]; clypeus with [Figure 200] or without yellow maculation 8

199


200

7(6). Mesoscutal punctures deeply impressed [Figure 560]; marginal hair fringe on posterior edge of sternum V broadly rounded [Figure 201]; dorsal propodeal surface striate [Figure 559]; retrorse lobe of genitalia greatly reduced, slender [Figure 563]; Pacific coastal area from British Columbia south to Santa Barbara County, California [Figure 554] . . . . 31. ***L. pacificum*** (Cockerell)

Mesoscutal punctures weakly impressed [Figure 662]; marginal hair fringe on posterior edge of sternum V narrowly rounded [Figure 202]; dorsal propodeal surface striate to reticulate [Figure 624]; retrorse lobe only slightly reduced, slender basally [Figure 625]; southern Oregon, south along the Pacific coastal area and Sierra Nevada [Figure 554] . . . . 40. ***L. timberlakei***, new species



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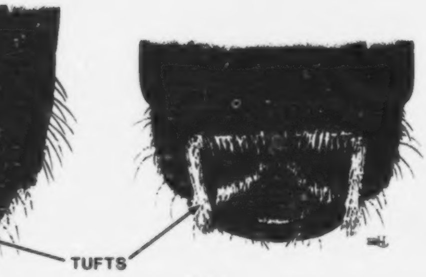


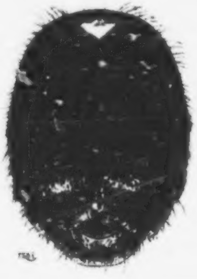
202

8(6). Sternum V with median, longitudinal patch of short, dense hairs [Figure 203]; clypeus and hind basitarsus dark brown; western species from Vancouver Island, south to Idaho and central California [Figure 531] .... 29. ***L. olympiae*** (Cockerell)

Sternum V without median, longitudinal patch of short, dense hairs, vestiture as in [Figures 204, 205]; clypeal maculation usually present ([Figure 200]; rarely weakly developed to absent in *L. zonulum*); hind basitarsus yellow or dark brown 9

9(8). Hind basitarsus yellow; posterior edge of sternum VI with inverted, "V-shaped" depression bordered by conspicuous, elongate hairs [Figure 204] ..... 26. ***L. leucozonium*** (Schrank)

Hind basitarsus dark brown; posterior edge of sternum VI without "V-shaped" depression, vestiture as in [Figure 205] .... 51. ***L. zonulum*** (Smith)



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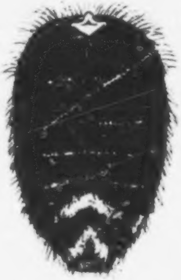

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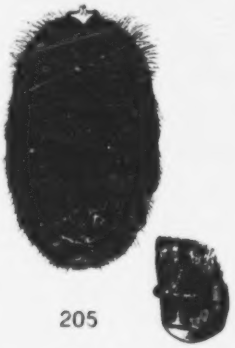
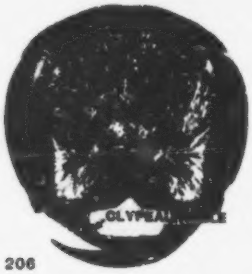


205

10(3). Mandibles conspicuously elongate, obviously exceeding distance to opposing clypeal angle [Figures 206, 209] 11

Mandibles short to moderately elongate, at most, only slightly exceeding distance to opposing clypeal angle [Figure 207] 16



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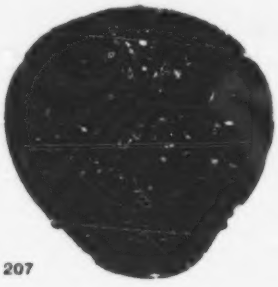

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11(10). Hind basitarsus yellow to yellowish orange 12

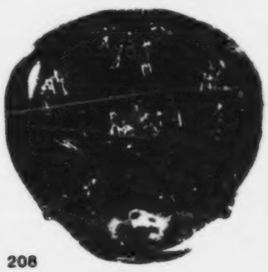
Hind basitarsus dark brown 14

12(11). Pronotal lateral ridge incomplete, obviously interrupted by oblique lateral sulcus (as in [Figure 10]); northeastern states and eastern Canada, west to Minnesota and Alberta [Figure 406] . . . . 18. ***L. acuminatum,*** new species

Pronotal lateral ridge appearing complete, at most, minutely interrupted by narrow sulcus [Figure 100]; southwestern and western United States [Figure 485] 13

13(12). Head moderately elongate, appearing at least as long as broad ([Figure 208], length/width ratio 0.88–0.96); sternum V with erect, elongate hair tufts [Figure 325]; known only from California Channel Islands . . . . 9. ***L. channelense,*** new species

Head short, appearing broader than long ([Figure 209], length/width ratio 0.82); sternum V with inconspicuous, suberect hairs; from mainland southern California, Arizona, Nevada, and Utah [Figure 485] . . . . 25. ***L. lampronotum,*** new species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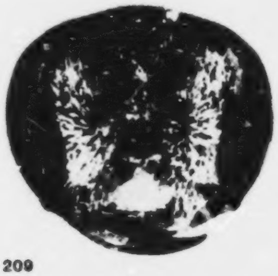
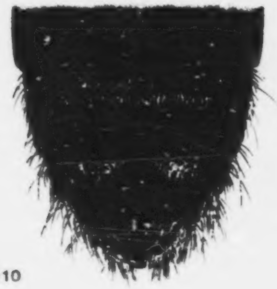

209

14(11). Anterior edge of mesoscutum not elevated from pronotum [Figure 87]; posterior two-thirds of propodeal dorsal surface smooth, highly polished; eastern United States [Figure 353] . . . . 13. ***L. coriaceum*** (Smith)

Anterior edge of mesoscutum elevated from pronotum [Figure 90]; posterior two-thirds of propodeal dorsal surface weakly ruguloso-striolate; western United States and Mexico [Figures 457, 472] 15

15(14). Posterior edge of sternum V with broadly rounded, weakly produced lateral hair lobes [Figure 210]; South Dakota to Mexico [Figure 457] . . . . 22. ***L. heterorhinum*** (Cockerell)

Posterior edge of sternum V with conspicuously rounded, strongly produced lateral hair lobes [Figure 211]; Arizona (Cochise County) and Mexico [Figure 472] . . . . 23. ***L. jubatum*** (Vachal)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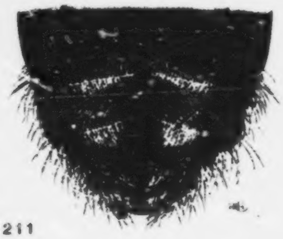
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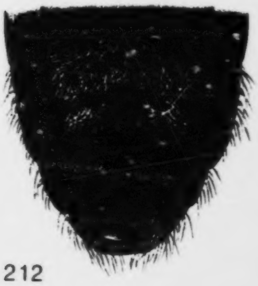
16(10). Sternum V with elongate, erect, lateral hair tufts [Figure 212]; posterior edge of sternum V never with hair lobes 17

Sternum V without elongate, erect, lateral hair tufts ([Figures 214, 227]; at most with median rosette of elongate hairs as in *L. mellipes* [Figure 213]); posterior edge of sternum V with [Figure 214] or without hair lobes 20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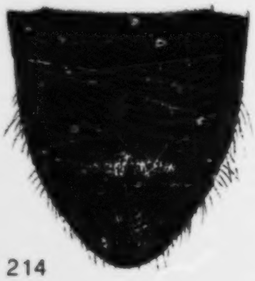
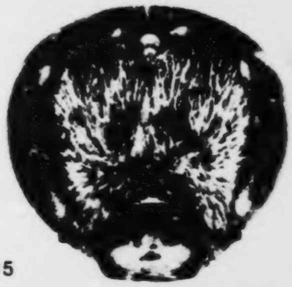

214

17(16). Head moderately elongate, only slightly wider than long ([Figure 215]; length/width ratio $\bar{x} = 0.95$); antennal flagellum reddish brown beneath, contrasting with darker upper portion; gonostylus extremely robust, apex broadly triangular [Figure 217]; tarsi dark brown, northeastern United States to British Columbia, south to Oregon, Colorado and Utah [Figure 287] . . . . 5. ***L. athabascense*** (Sandhouse)

Head elongate, width at most subequal to length ([Figure 216]; length/width ratio $\bar{x} = 0.96$–1.02 for three species); antennal flagellum usually uniformly dark (reddish brown ventrally in some specimens of *L. egregium*); gonostylus moderately robust, apex narrowly rounded [Figure 218]; tarsi yellowish orange or dark brown; western United States and Canada, east to Colorado and Wyoming [Figure 668] 18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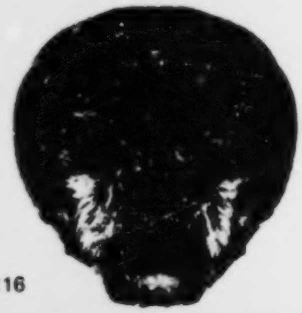
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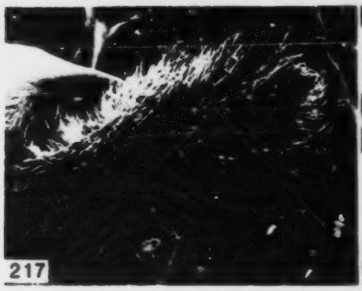
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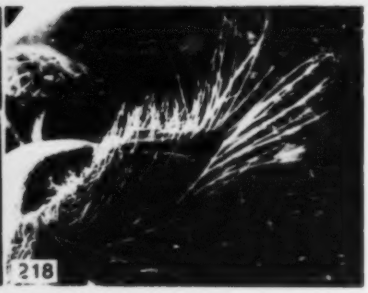
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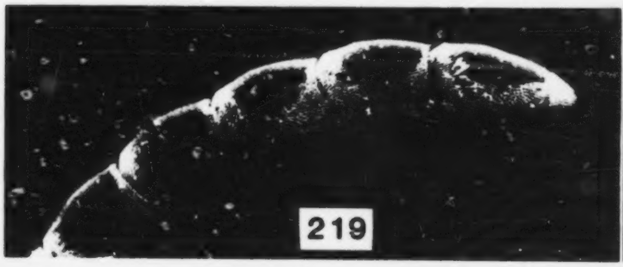
18(17). Hind tarsus yellowish orange; coastal and cismontane California [Figures 695, 696] . . . . 46. ***L. mellipes*** (Crawford)

Hind tarsus dark brown; widespread in western states and Canada to Colorado and Wyoming [Figures 682, 708] 19

19(18). Antennal flagellomeres with oval tyli (darkened, sharply delimited areas, contrasting with rest of flagellomere [Figure 219]); hair tufts on sternum V slightly shorter than those on sternum IV . . . . 47. ***L. trizonatum*** (Cresson)

Antennal flagellomeres without tyli [Figure 220]; hair tufts on sternum V appearing subequal in length to those on sternum IV . . . . 45. ***L. egregium*** (Vachal)



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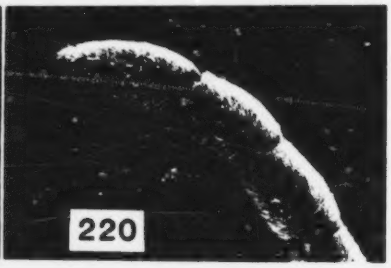


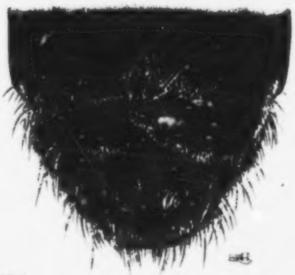
220

20(16). Hind tarsus yellow to yellowish orange, contrasting with dark tibia 21

Hind tarsus dark brown, concolorous with tibia 23

21(20). Sternum V with median rosette of elongate, erect hairs [Figure 221]; western species, from Washington, Oregon, and California [Figures 695, 696] . . . . . 46. ***L. mellipes*** (Crawford)

Sternum V without median rosette, hairs short, suberect, not forming noticeable pattern [Figure 222]; eastern species, west to Idaho, Utah, and New Mexico [Figure 406] 22



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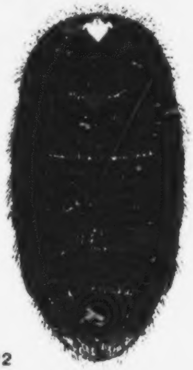

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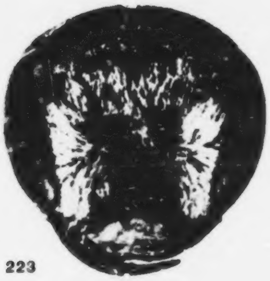
22(21). Head moderately elongate ([Figure 223]; length/width ratio x̄ = 0.93); primarily from northcentral states, west to Alberta, Idaho, Utah, and New Mexico [Figure 406] . . . . 20. ***L. paraforbesii,*** new species

Head short ([Figure 224]; length/width ratio x̄ = 0.88); primarily from southern northcentral and southern Atlantic states [Figure 406] . . . . 19. ***L. forbesii*** (Robertson)



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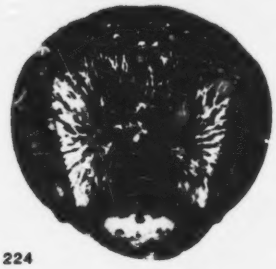


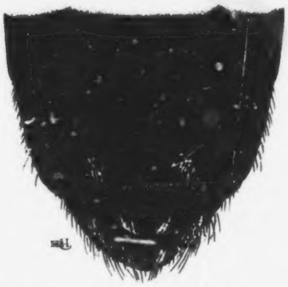
224

23(20). Posterior half of dorsal propodeal surface smooth, entirely lacking striae and rugulae, moderately dull (microscopically alveolated); posterior edge of sternum V with characteristic, somewhat straight-edged lateral hair lobes [Figure 225]; Arizona (Cochise and Santa Cruz counties), Mexico [Figure 245] . . . . 1. ***L. acarophilum,*** new species

Posterior half of dorsal propodeal surface ruguloso-striolate, shiny, not noticeably alveolated; posterior edge of sternum V with conspicuous lateral hair lobes [Figures 226, 227] or lobes indistinct to absent; distribution variable 24

24(23). Posterior edge of sternum V with conspicuous lateral hair lobes [Figures 226, 227] 25

Posterior edge of sternum V without noticeable lateral hair lobes 26



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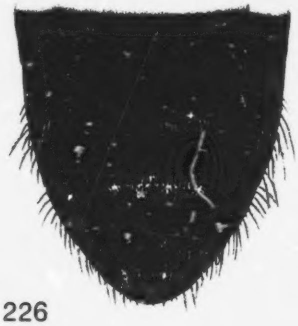

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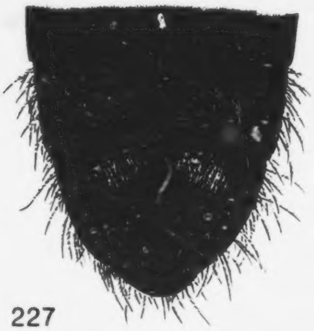
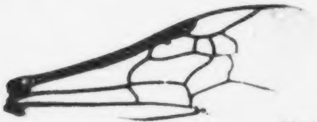


227

25(24). Lateral hair lobes on posterior edge of sternum V broadly rounded, moderately elongate, narrowly separated [Figure 226]; forewing entirely hyaline [Figure 228]; basal half of clypeus broadly rounded . . . . 16. ***L. desertum*** (Smith)

Lateral hair lobes on posterior edge of sternum V narrowly rounded, elongate, widely separated [Figure 227]; apex of forewing infuscated [Figure 229]; clypeus entirely flat . . . . 27. ***L. manitouellum*** (Cockerell)



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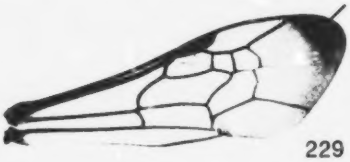
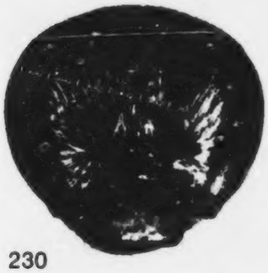


229

26(24). Head circular, width slightly exceeding length [Figure 230]; basal half of clypeus conspicuously rounded; mesoscutal punctation sparse on posterior half, many punctures separated by 1.5–2 times their width . . . . 12. ***L. colatum*** (Vachal)

Head elongate, appearing longer than broad [Figures 231, 232]; basal half of clypeus rounded or flat; mesoscutal punctation dense on posterior half, punctures separated by their width or less 27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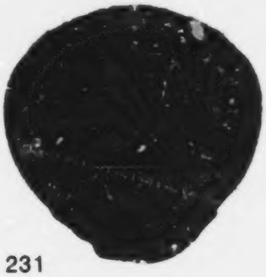
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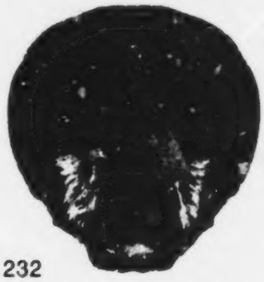
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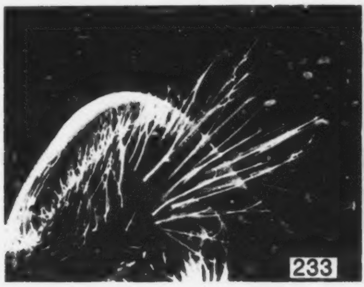
27(26). Gonostylus truncate apically [Figure 233]; base of clypeus clearly rounded; apical half of clypeus virtually impunctate; southern Arizona, New Mexico, Texas, and northern Mexico [Figure 519] . . . . 28. ***L. morrilli*** (Cockerell)

Gonostylus narrowly rounded apically [Figure 234]; base of clypeus indistinctly rounded to conspicuously flat; apical half of clypeus with fine but distinct punctures; widespread in western states, south to southern California and Colorado [Figures 669, 708] 28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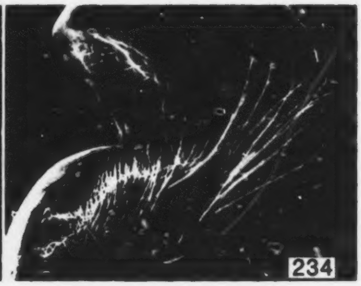
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28(27). Head elongate ([Figure 231], length/width ratio 0.87–0.96); clypeal maculation present or absent [Figure 231]; base of clypeus indistinctly rounded . . 44. ***L. anhypops***, new species

Head conspicuously elongate ([Figure 232], length/width ratio 1.0–1.05); clypeal maculation present [Figure 232]; base of clypeus conspicuously flat . . . . . 47. ***L. trizonatum*** (Cresson)

Key to *Lasioglossum* Males South of the Mexican Border

1. Tergum I with basal hair band, hairs pale, short and adpressed (as in [Figure 194]); dorsal propodeal surface striate; tegulae translucent, yellow . . . . 39. ***L. sisymbrii*** (Cockerell)

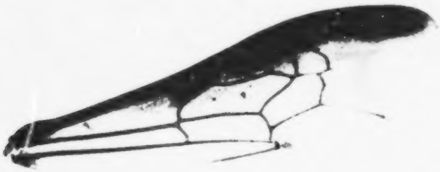
Tergum I without basal hair band; dorsal propodeal surface ruguloso-striolate to striate; tegulae yellowish brown to brown 2

2(1). Apex and marginal cell of forewing infuscated [Figure 235] 3

Forewing entirely hyaline or, at most, with apex infuscated [Figure 229] 5

3(2). Mandibles conspicuously elongate, reaching opposing mandibular base [Figure 236]; pronotal lateral angle a sharply projecting right angle . . . . 17. ***L. eickworti,*** new species

Mandibles short, just reaching opposing clypeal angle [Figure 207]; pronotal lateral angle obtuse, weakly projecting 4



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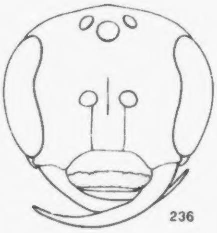
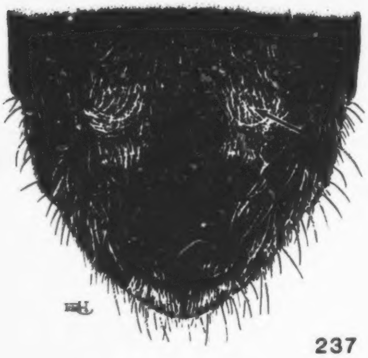


236

4(3). Sternum V with erect, lateral hair tufts [Figure 237]; posterior edge of sternum V with inconspicuous lateral hair lobes [Figure 237]; terga IV–VI with usual basal hair bands . . . . 43. ***L. tricnicos*** (Vachal)

Sternum V without erect, lateral hair tufts [Figure 238]; posterior edge of sternum V with distinct lateral hair lobes [Figure 238]; terga IV–VI entirely covered by short, pale, adpressed pubescence ([Figure 1]; hairs worn in some specimens) . . . . 15. ***L. crocoturum*** (Vachal)



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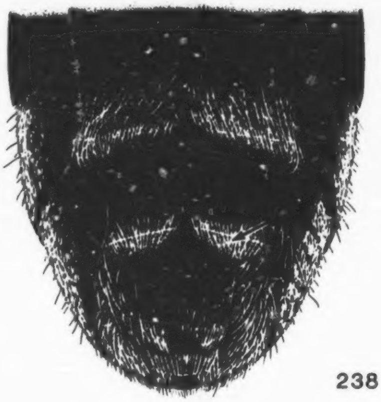


238

5(2). Pronotal lateral ridge appearing complete, not obviously interrupted by oblique lateral sulcus ([Figure 9]; minutely notched in *L. transvorsum* [Figure 11], where posterior margin of dorsal propodeal surface is conspicuously "V-shaped" and elevated [Figure 185]) 6

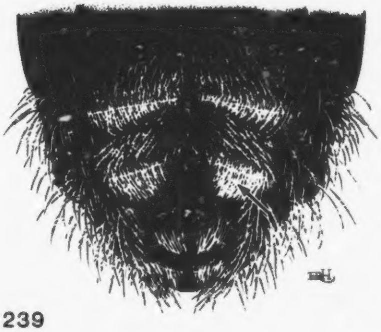
Pronotal lateral ridge incomplete, interrupted by lateral oblique sulcus [Figure 10] 12

6(5). Sternum V with erect lateral hair tufts and conspicuously rounded, widely separated lateral hair lobes on posterior edge [Figure 239]; mandibles elongate, reaching midway between opposing clypeal angle and opposing mandibular base . . . . 23. ***L. jubatum*** (Vachal)

Sternum V with either erect lateral hair tufts or lateral hair lobes on posterior edge but not both [Figures 240, 241]; mandibles elongate or short 7

7(6). Sternum V with erect lateral hair tufts, often including conspicuously elongate, curled hairs [Figures 241, 242]; posterior edge of sternum V without conspicuous lateral hair lobes [Figures 241, 242] 8

Sternum V without erect lateral hair tufts [Figure 240]; posterior edge of sternum V usually with lateral hair lobes [Figure 241] or with conspicuous hair fringe [Figure 243] 10



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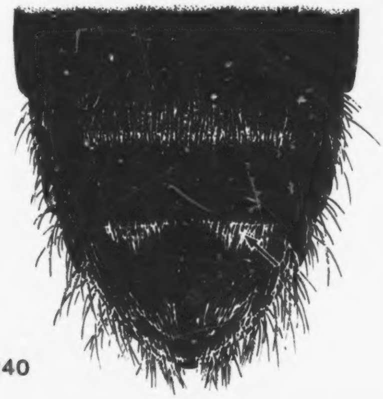

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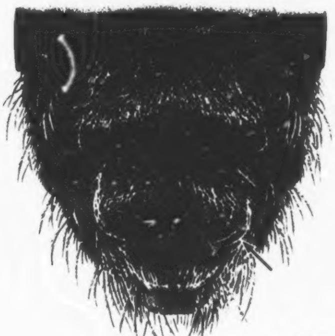
8(7). Pronotal lateral angle a sharply projecting right angle (as in [Figure 190]); dorsal propodeal surface strongly striate with broad interspaces between striae (as in [Figure 180]); clypeus without yellow, apical maculation (as in [Figure 199]) . . . . 30. ***L. orphnaeum,*** new species

Pronotal lateral angle obtuse, weakly projecting; dorsal propodeal surface ruguloso-striolate, without broad interspaces between striae and rugulae (as in [Figure 193]); clypeus with yellow, apical maculation [Figure 200] 9

9(8). Anterior surface of tergum I with conspicuous impunctate, hairless areas (as in [Figure 162]); lateral hair tufts on sternum V with extremely elongate, curled hairs [Figure 241]; head short, appearing broader than long ([Figure 571], length/width ratio 0.86–0.95) . . . . 32. ***L. pallicorne*** (Vachal)

Anterior surface of tergum I lacking impunctate, hairless areas; lateral hair tufts without extremely elongate, curled hairs [Figure 242]; head moderately elongate, appearing slightly longer than broad (length/width ratio 0.91–1.0) . . . . 4. ***L. asaphes,*** new species



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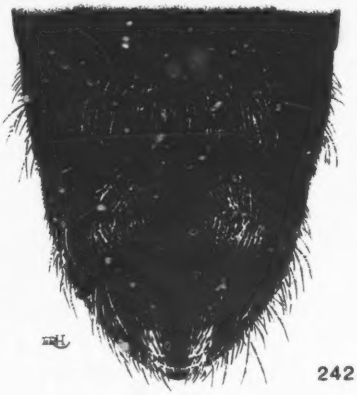


242

10(7). Posterior half of dorsal propodeal surface entirely smooth, conspicuously shiny and polished . . . . 3. ***L. argutum*****,** new species

Posterior half of dorsal propodeal surface ruguloso-striolate to striolate, not smooth and polished 11

11(10). Posterior margin of dorsal propodeal surface "V-shaped" (as in [Figure 185]); head moderately elongate, appearing at least as long as broad (length/width ratio 0.96–1.04); mandibles short, just reaching opposing clypeal angle (as in [Figure 207]) . . . . 42. ***L. transvorsum*** (Vachal)

Posterior margin of dorsal propodeal surface broadly rounded; head short, appearing broader than long ([Figure 209], length/width ratio 0.77–0.92), mandibles moderately elongate, obviously reaching beyond opposing clypeal angle [Figure 209] . . . . 22. ***L. heterorhinum*** (Cockerell)

12(5). Posterior half of dorsal propodeal surface entirely smooth, lacking striae and rugulae (as in [Figure 165]); surface of propodeum dull, obviously alveolated (as in [Figure 165]) . . . 13

Posterior half of dorsal propodeal surface ruguloso-striolate to striolate (as in [Figure 164]); surface of propodeum shiny, not noticeably alveolated 14

13(12). Anterior half of mesoscutum with median longitudinal ridge (as in [Figure 174]). . . . . 48. ***L. tropidonotum*****,** new species

Mesoscutum without median longitudinal ridge . . . . 1. ***L. acarophilum*****,** new species and 49. ***L. uyacicola*** (Cockerell)

14(12). Sternum V with erect, elongate lateral hair tufts [Figure 242] . . 4. ***L. asaphes*****,** new species

Sternum V without erect, lateral hair tufts [Figures 243, 244] 15

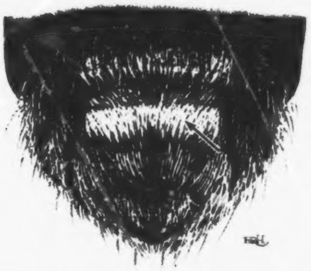
15(14). Posterior edge of sternum V without distinct lateral hair lobes or hair fringe; southwestern United States and northern Mexico [Figure 519]. . . . . 28. ***L. morrilli*** (Cockerell)

Posterior edge of sternum V with conspicuous lateral hair lobes [Figures 243, 244]. 16

16(15). Terga IV–V entirely covered by short, pale, adpressed pubescence (as in [Figure 1]); posterior edge of sternum V with conspicuous hair fringe, fringe not distinctly divided medially into lateral lobes [Figure 243] . . . . 8. ***L. cercothrix*****,** new species

Terga IV–V with usual basal hair bands; posterior edge of sternum V with distinctly separated lateral hair lobes [Figure 244] 17

17(16). Posterior edge of sternum V with median rosette of short, dense hairs that expand laterally into elongate hair lobes [Figure 244] . . . . 14. ***L. costale*** (Vachal)



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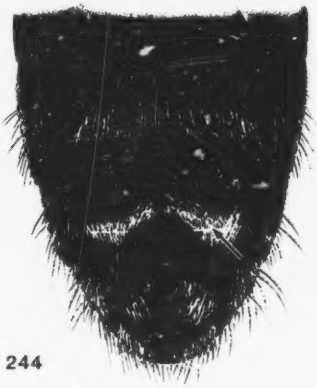


244

Posterior edge of sternum V without median rosette of short, dense hairs [Figures 226, 227] 18

18(17). Lateral hair lobes on posterior edge of sternum V broadly rounded, moderately elongate, narrowly separated [Figure 226]; forewing entirely hyaline; basal half of clypeus broadly rounded . . . . 16. ***L. desertum*** (Smith)

Lateral hair lobes on posterior edge of sternum V narrowly rounded, elongate, widely separated [Figure 227]; apex of forewing infuscated; clypeus entirely flat . . . . 27. ***L. manitouellum*** (Cockerell)

1. ***Lasioglossum acarophilum*, new species**

FIGURES 14, 245–257

TYPE MATERIAL.—The female holotype of *L. acarophilum* is deposited in the National Museum of Natural History, Smithsonian Institution. It is missing the last two tarsomeres of the left hind leg but is otherwise in good condition. The specimen is labeled

Reef [19]04 Ar[izona]/CRBeidrman Collector/HOLOTYPE Lasioglossum acarophilum R.J. McGinley [red label].

Seventy-eight female and 2 male paratypes are designated and listed in the "Specimens Examined" section.

ETYMOLOGY.—The specific epithet is derived from the Greek *akari* (mite) plus *phileo* (love), a reference to the association of this species with phoretic mites.

DISTRIBUTION (Figure 245).—*Lasioglossum acarophilum* is presently known from southern Arizona (Cochise and Santa Cruz counties) south to Honduras. Specimens are not yet known from the northern Mexican states of Sonora, Chihuahua, and Coahuila.

DIAGNOSIS.—The combination of the elongate

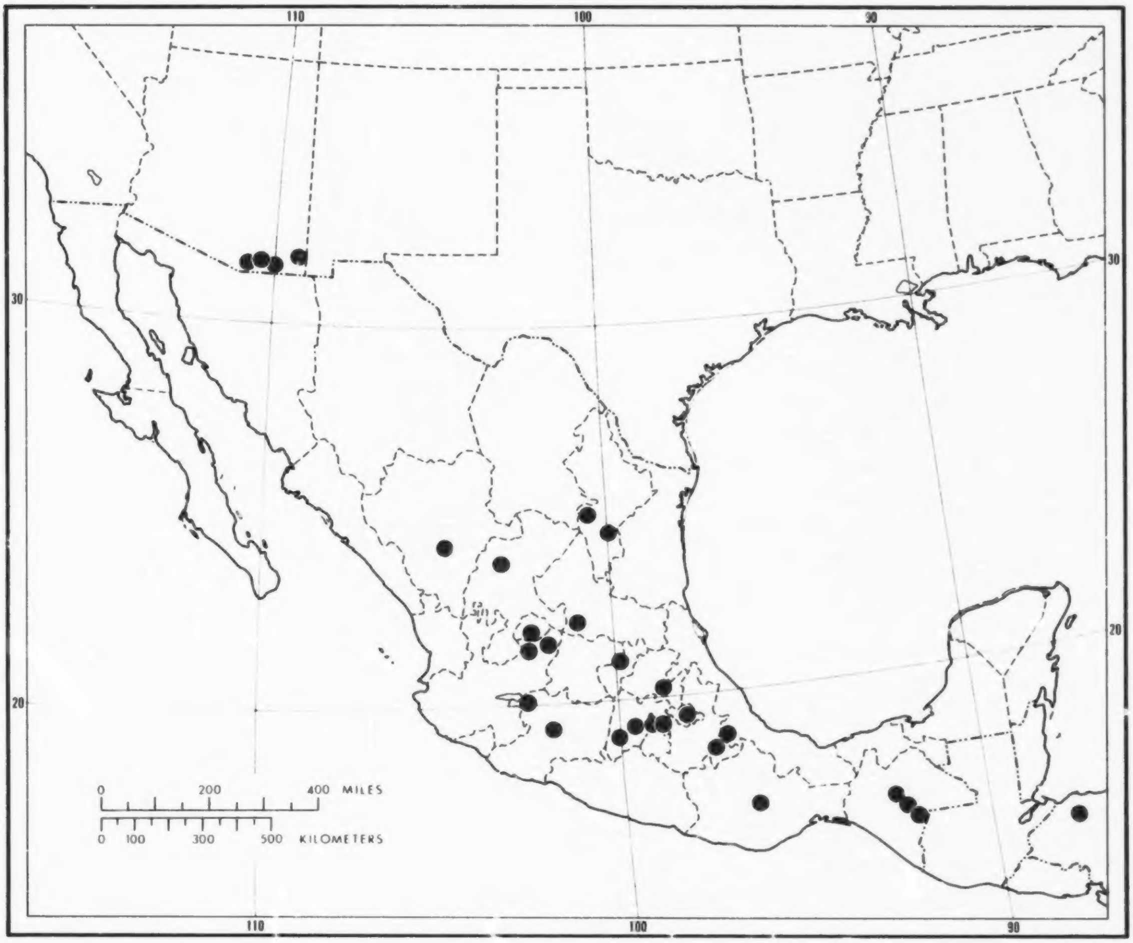


FIGURE 245.—Distribution of *Lasioglossum acarophilum*.

head (Figure 246), granuloso-punctate mesoscutum (Figure 251), smooth posterior half of the dorsal propodeal surface (Figure 250), and the large first tergal acarinarium (Figure 247) will distinguish *L. acarophilum* from all other known New World *Lasioglossum* except *L. uyacicola*. The latter species occurs with *L. acarophilum* in Chiapas, Mexico, but extends farther south to Panama (Figure 372). The mesoscutum of both species is actually obscurely doubly-punctate, with the smaller punctures of *L. uyacicola* (Figure 727) being much finer than those of *L. acarophilum*, giving the mesoscutum of the former species a smoother appearance under the light microscope.

In the United States only *L. manitouellum* has a similar granuloso-punctate mesoscutum but lacks an acarinarium. *Lasioglossum desertum* and *L. jubatum* have large tergal acarinaria but differ from *L. acarophilum* in having short heads (Figures 381, 473).

The smooth posterior half of the dorsal propodeal surface and the characteristic hair pattern on the posterior edge of sternum V will distinguish *L. acarophilum* males from other *Lasioglossum* except *L. uyacicola*. The males of these two species cannot be reliably differentiated at present. See *L. uyacicola* diagnosis for further details.

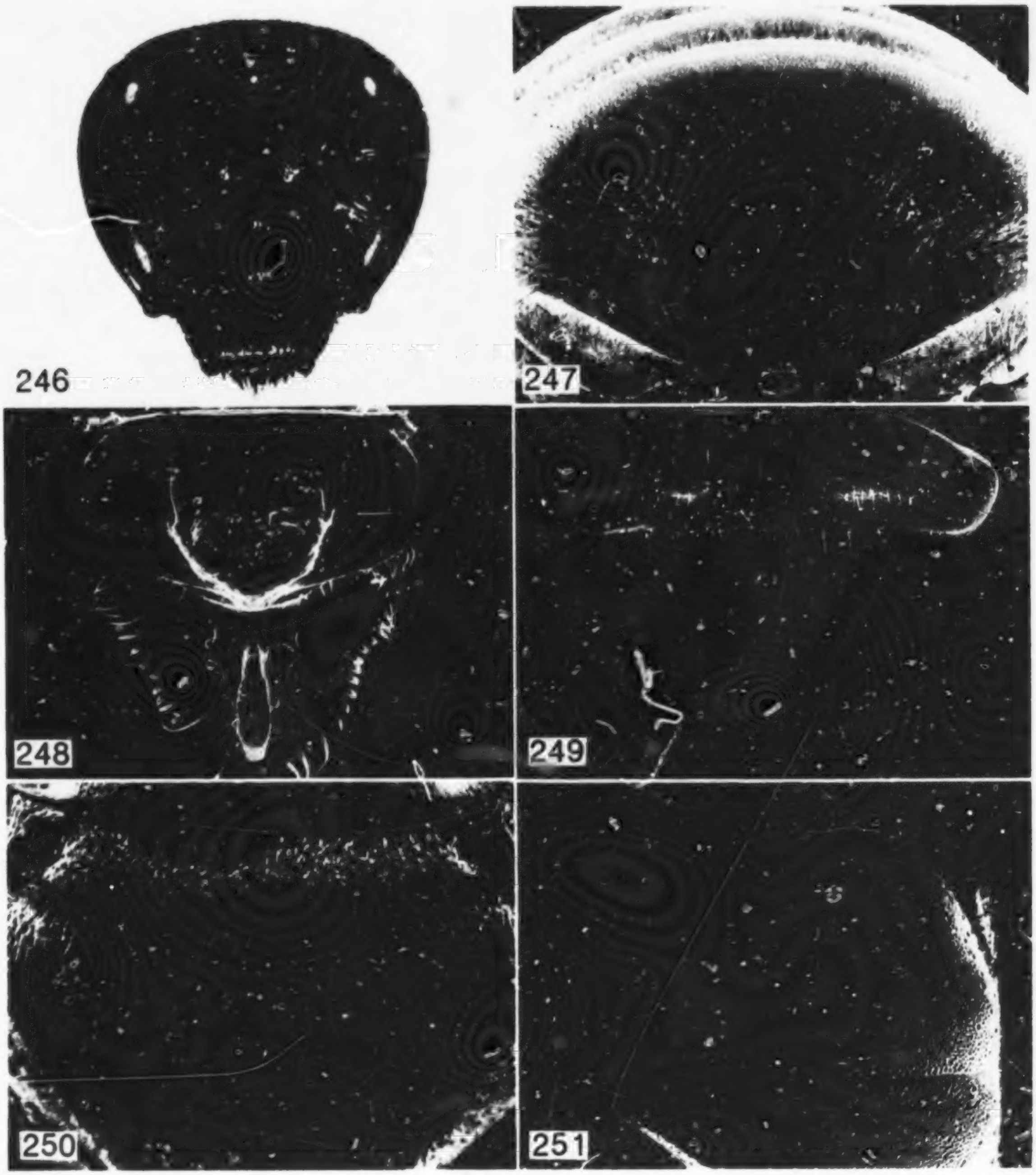
DESCRIPTION.—FEMALE: (1) Length 8.2–9.1 mm (x̄ = 8.7, n = 20); (2) wing length 2.3–3.0 mm (x̄ = 2.6, n = 20); (3) abdominal width 2.6–3.0 mm (x̄ = 2.8, n = 20).

Structure: (4) Head elongate (Figure 246; length/width ratio 0.92–0.98, x̄ = 0.94, n = 34). (7) Supraclypeal area somewhat narrowly rounded, (8) protuberant. (9) Clypeus greatly projecting below lower margin of eyes, approximately 0.93 of its length below eyes; (11) surface with median longitudinal sulcation, narrow dorsally, becoming broader towards ventral edge (sometimes obscured by punctures). (14) Distance between lateral ocelli slightly exceeding distance between lateral ocellus and eye. (23) Flagellomere 1 subequal to 2 in length along dorsal surface. Labrum as in Figure 248; (27) distal keel moderately broad in frontal view, lateral edges broadly bowed; (28) distal lateral projections small, triangular; (29) most fimbrial setae bluntly rounded.

(32) Pronotal lateral angle narrowly obtuse; (33) pronotal lateral ridge incomplete, interrupted by oblique lateral sulcus; (34) lower portion of lateral ridge sharply edged. (35) Mesoscutal lip weakly bilobed, (36) weakly elevated. (40) Dorsal surface of propodeum about 0.74 the length of scutellum and about 1.3 times the length of metanotum, (41) slightly depressed centrally, (42) posterior margin broadly rounded; (43) propodeal triangle very weakly defined, median V-shaped area inconspicuous, lateral rims absent; (44) lateral carinae extending at most to midpoint of posterior surface. (45) Tibial spur as in Figure 14.

(46) Lateral edge of metasomal tergum II very weakly sinuate, nearly straight.

Sculpture: (47) Face dull granular, with (48) punctures of two sizes, smaller punctures dense, separated by less than their diameter, larger punctures separated by 1 to 2 times their diameter. (51) Supraclypeal area extremely granulate, (52) punctation nearly uniform, punctures separated by their width laterally, less dense centrally. (53) Clypeus granulate basally, apical half polished; (54) punctures well formed, separated by less than their width basally, less dense apically, apicolateral areas punctate. (56) Mesoscutum moderately shiny; (57) doubly-punctate (Figure 251), smaller punctures granuloso-punctate, becoming less dense posteriorly, punctures 1–2 widths apart, larger punctures separated by 2–4 times their width (observable at 50 magnifications or more). (58) Scutellum granuloso-punctate medially and along edges, less dense adjacent to median line, punctures separated by their width or slightly less. (63) Dorsal surface of propodeum incompletely striolate, striae reaching posterior margin laterally, extending only to midpoint of surface medially; (64) surface extensively alveolated. (65) Metasomal tergum I moderately shiny; (66) punctation fine, moderately dense, punctures slightly less than their width apart.



FIGURES 246–251.—*Lasioglossum acarophilum:* 246, female head; 247, female acarinarium at base of tergum I; 248, female labrum; 249, male labrum; 250, female propodeum; 251, female mesoscutum.

Coloration: (71) Wing membrane hyaline, obscurely infuscated at apex.

Vestiture: (73) Unlike most species, hairs between vertex and antennae conspicuously simple, recurved, contrasting with plumose hairs near antennae, (74) hairs white. (75) Pubescence of thorax white; (76) mesoscutal hairs sparse, inconspicuous, moderately plumose. (77) Hind tibial hair color highly differentiated, most hairs white, dorsal hairs very dark-brown to black basally, becoming light-brown to almost white distally. (78) Anterior hairs of metasomal tergum I and (79) basal hair bands of terga II–IV white. (80) Acarinarium present (Figure 247), a large circular, glabrous area at base of tergum I, surrounded laterally and dorsolaterally by elongate fringe hairs, dorsal opening of acarinarium wide, opening subequal to width of lateral hair fringe as seen in dorsal view.

MALE: Similar to female except as follows: (1) length 7.8–8.2 mm ($\bar{x}$ = 8.0, n = 2); (2) wing length 2.2–2.3 mm ($\bar{x}$ = 2.2, n = 2); (3) abdominal width 2.0 mm ($\bar{x}$ = 2.0, n = 2). (4) Head elongate (length/width ratio 0.91–0.96, $\bar{x}$ = 0.94, n = 2). (5) Gena subequal to eye in width, (6) moderately produced posteriorly. (11) Clypeal surface shallowly depressed ventrally. Labrum as in Figure 249; (23) distal process absent; (25) basal area depressed medially; (26) basal lateral depressions conspicuously developed. (30) Mandible short, just reaching opposing clypeal angle. (53) Clypeus granulate basally, apical half polished; (54) punctures well formed and dense basally, very fine and scattered over apical half. (68) Clypeal maculation present. (69) Flagellum yellowish orange ventrally. (72) Tarsi dark, concolorous with tibiae.

Vestiture: Sternal vestiture as in Figure 252; (82) hairs on sternum IV elongate, suberect; (83) sternum V without conspicuous erect hairs, posterior edge with straight-edged adpressed lateral hair lobes.

Terminalia: Sterna VII–VIII as in Figure 256; (85) sternum VIII with acute median process. Genitalia as in Figures 253–255; (86) gonobase elongate; (87) gonostylus extremely elongate and slender; (88) retrorse membranous lobe present, (89) slender, sharply pointed; (90) volsella with moderately prominent lateral lobe.

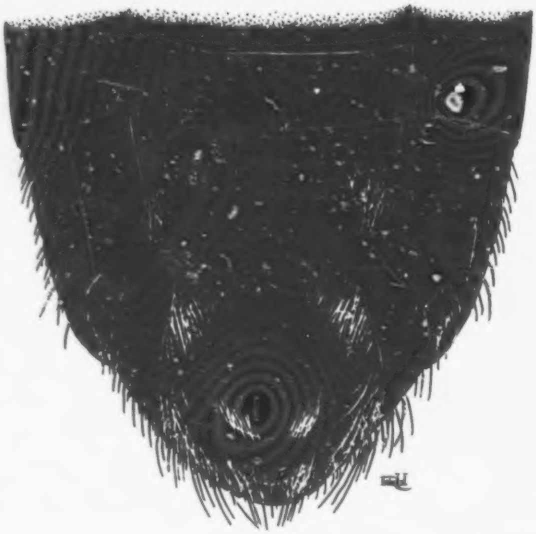


FIGURE 252.—*Lasioglossum acarophilum*, male sternal vestiture.

FLIGHT RECORDS (Figure 257).—*Lasioglossum acarophilum* females have been collected from late March through December. Most records are from July and August, with a peak in early August. One male was collected in December.

FLOWER RECORDS.—Females (12): Labiatae 33%; Compositae 25%; Convolvulaceae 17%; Leguminosae 17%. Total: 6 families, 9 genera as follows:

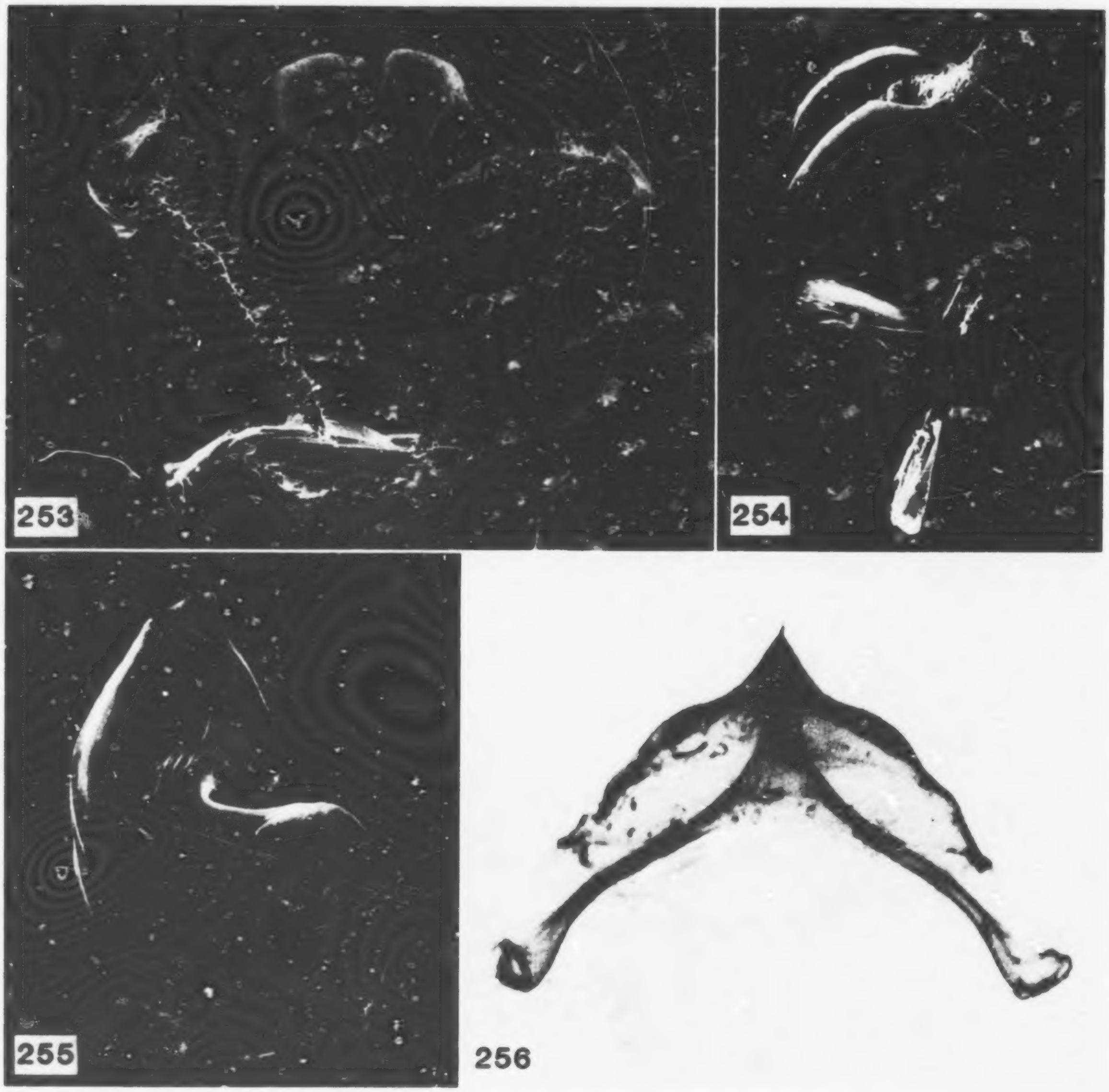
Helenium 1♀; **Helianthus* 1(1)♀; *Heterotheca* 1♀; *Ipomoea* 2♀; *Leucophyllum* 1♀; *Monarda* 1♀; *Prosopis* 1♀; *Salvia* 3♀; **Solanum* 1♀.

SPECIMENS EXAMINED.—79 (77♀, 2♂).

GUATEMALA. Duenas, 18 Aug 1947, 4500 ft, C. & P. Vaurie (2♀; ANSP).

HONDURAS. Suyapa Morazan, 3 Nov 1965, N.L.H. Krauss (1♀; USNM).

MEXICO. AGUASCALIENTE: 1 Dec 1909, F.C. Bishopp (2♀; USNM). CHIAPAS: San Cristobal de las Casas, 1 Aug 1952, E.E. Gilbert, C.D. MacNeil (1♀; UCB), 5 Jul 1956, J.W. MacSwain (1♀; UCB), 27 Jul–8 Aug 1957, J.A. Chemsak, B.J. Rannells (2♀; UCB), 5–8 mi SE, 5–10 Jul 1956, J.W. MacSwain, D.D. Linsdale (2♀; UCB), 7–39 mi E, 1 Aug



Figures 253–256.—*Lasioglossum acarophilum*, male: 253, genitalia, ventral view; 254, same, lateral view; 255, volsella; 256, sterna VII–VIII.

1952, E.E. Gilbert, C.D. MacNeil (6♀; UCB), 5 mi SE, 5 July 1956, D.D. Linsdale (1♀; UCB); Comitan, 3 mi W, 14 July 1957, J. Chemsak, P.D. Hurd (1♀; UCB), 10 mi NW, 9 Aug 1963, F.D. Parker, L.A. Stange (1♀; UCD). **Durango**: Durango, 7 mi W, 11 Aug 1964, 7000 ft, W.R.M. Mason (1♀; CU), 12 mi SW, 24 Jul 1953, Univ. Kansas Mex. Exped. (1♀; KU). **Distrito Federal**: 5 Aug 1928, 2300 m, G. Lassmanu (1♀; CU); Los Reyes, 2 mi SE, 2 Jul 1953, C.D. McNeil (1♀; UCB). **Hidalgo**: Epazoyucan, 17 Jun 1961, 8100 ft, Univ. Kansas Mex. Exped. (1♀; KU); Pachuca, 5 mi N, 25 Aug 1962, 8750 ft, Ordway, Marston (1♀; KU); Tulancingo, 7 mi S, 26 Aug 1962, 7500 ft, Naumann, Roberts (1♀; KU); Zimapan, 3 mi E, 28 Sep 1975, 6200 ft, J. Powell, J. Chemsak, I. Friedlander (1♀; UCB). **Jalisco**:

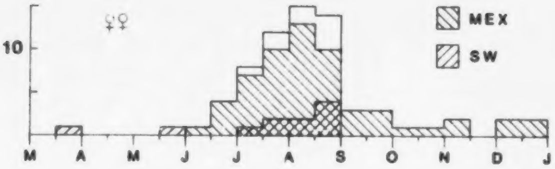


FIGURE 257.—*Lasioglossum acarophilum* flight records (outer line = total).

Lagos de Moreno, 15.5 mi NE, 26 Jul 1962, 6200 ft, Univ. Kansas Mex. Exped. (1♀; KU); Teocaltiche, 13 Sep 1977, R.W. Brooks (1♀; RWB). MEXICO: Temascaltepec, 5.8 mi SE, 28 Aug 1962, 8100 ft, Univ. Kansas Mex. Exped. (1♀; KU); Tepexpan, 26 Jul 1963, F.D. Parker, L.A. Stange (1♀; UCD); Texcoco, 11 mi W, 20 Jun 1962, D.H. Janzen (1♀; UCB); Toluca, 26 mi S, 9 Aug 1954, 7700 ft, Univ. Kansas Mex. Exped. (1♀; KU).

MICHOACAN: Patzcuaro, 7.7 km NE, 23 Sep 1976, C.D. George, R.R. Snelling (1♀; LACM); Zamora, 28 Aug 1954, E.G. Linsley, J.W. MacSwain, R.F. Smith (1♀; UCB). NUEVO LEON: Saltillo, 41 mi S, 7 Sep 1962, 6200 ft, Univ. Kansas Mex. Exped. (1♀; KU); San Pedro Iturbide, 32 km W Linares, 6 Oct 1962, H. & M. Townes (1♀; MSUEL). OAXACA: Mitla, 26–27 Jul 1962, 5000–5500 ft, H.E. Milliron (2♀; CNC); Guelatao, 22 km NE, 18 Sep 1976, C.D. George, R.R. Snelling (1♀; LACM); Yanhuitlan, 11.4 km N, 20 Oct 1976, 2408 m, C.D. George, R.R. Snelling (1♀; LACM). PUEBLA: Esperanza, 7 km NW, 11 Jul 1974, 2560 m, J. Chemsak, J. Powell (1♀; UCB); Moreles Canada, 7 km SE, 4–5 Jul 1974, J. Chemsak, J. Powell (1♀; UCB); Tehuacan, 5 Sep 1957, 5381 ft, H.A. Scullen (1♀; OrS), 6 mi SW, 9 Aug 1980, Schaffner, Weaver, Friedlander (1♀; TAM). SAN LUIS POTOSI: San Luis Potosi, 4 Jun 1977, C. Porter, A. Cerbone (1♀; KU), 20 mi SW, 25 Jul 1962, 6800 ft, Univ. Kansas Mex. Exped. (3♀; KU). TLAXCALA: Apizaco, 8 mi W, 18 Jun 1961, 8200 ft, Univ. Kansas Mex. Exped. (1♀; KU), 10 mi N, 20 Aug 1962, 7800 ft, Univ. Kansas Mex. Exped. (4♀; KU); Huamantla, 26 Jul 1956, W.J. Gertch (1♀; AMNH). VERACRUZ: Cotaxtla Exp. Sta., Cotaxtla, 24 Jun 1962, D.H. Janzen (1♀; UCB); Orizaba, 10 mi W, 31 Dec 1940, G.E. Bohart (2♀; CAS); Rio Blanco, 13 Nov 1957, R. & K. Dreisbach (1♀; MSUEL). ZACATECAS: Tropic of Cancer & Highway 45, 24 Dec 1958, Menke & Stange (1♂; LACM).

UNITED STATES. ARIZONA: *Cochise Co.:* Carr Canyon, Huachuca Mts., 15 mi S Sierra Vista, 16 May 1967, 56[00]–6000 ft, Sternitzky (1♀; CNC), 13 Aug 1969, 5200 ft, R.R. Snelling (1♀; LACM); Huachuca Mts., 1 Aug 1927, R.H. Beamer (1♀; KU), 30 Aug 1953, G.D. Butler (1♀; UAT), 12 Jul 1955, G. Butler, F. Werner (1♀; UAT), 25 Aug 1972, Zavortink (1♀; CU), Jul (1♀; USNM); S.W. Research Station, 28 Aug 1958, H.V. Weems (1♀; FSCA). *Pima Co.:* Madera Canyon, Bogg Springs Campground, 30 Jul 1973, 4500 ft, R. Coville (1♀; UCB). *Santa Cruz Co.:* Canelo, 18 Mar 1967, Sternitzky (1♀; CNC). *County unknown:* Reef, 1904, C.R. Beidrman (7♀, including holotype, 1♂; USNM).

2. *Lasioglossum aequatum* (Vachal)

FIGURES 16, 258–260

Halictus aequatus Vachal, 1904:473 [female].—Cockerell, 1905a:90 [key].

Lasioglossum aequatum.—Moure and Hurd, 1986:59 [catalog].

TYPE MATERIAL.—The female holotype is in the Naturhistorisches Museum, Vienna. At some time, the head and front legs were broken off and crudely glued back to the thorax, the vertex being attached to the pronotum and mesoscutum. The left front leg is missing and the metasomal basal hair bands are matted and dark. The specimen is labeled

Forrer./Mexico Mazatl[an] 1883. III [March] Farrer./aequatus Vach.[al] det. J. Vachal/Hal.[ictus] aequatus Vach.[al] [handwritten]/LASIOGLOSSUM ♀ Lasioglossum aequatum (Vachal, 1904) Holotypus des. A.W. Ebmer 1980 [right edge with red border].

DISTRIBUTION (Figure 258).—Only three female specimens of this Mexican species are known: the holotype from Mazatlan, one specimen from near Mexico City, and another from El Chico, Hidalgo.

DIAGNOSIS.—*Lasioglossum aequatum* is unique in having the dorsal propodeal surface strongly and regularly striate, the striae being fine and reaching the posterior propodeal margin (Figure 259). Other helpful characters are as follows: head short (similar to Figure 303); mesoscutum coarsely granuloso-punctate (similar to Figure 336 but punctures not so large); acarinarium absent; forewing membrane hyaline with infuscated apex. *Lasioglossum costale* is similar but in addition to differing in propodeal sculpture has pale orange wing membranes and less coarse mesocutal punctation. *Lasioglossum crocoturum* and *L. cercothrix* have metasomal terga IV–V entirely covered by short, adpressed pubescence (Figure 1). *Lasioglossum tricnicos* is superficially similar but has the anterior costal edge of the forewing conspicuously infuscated.

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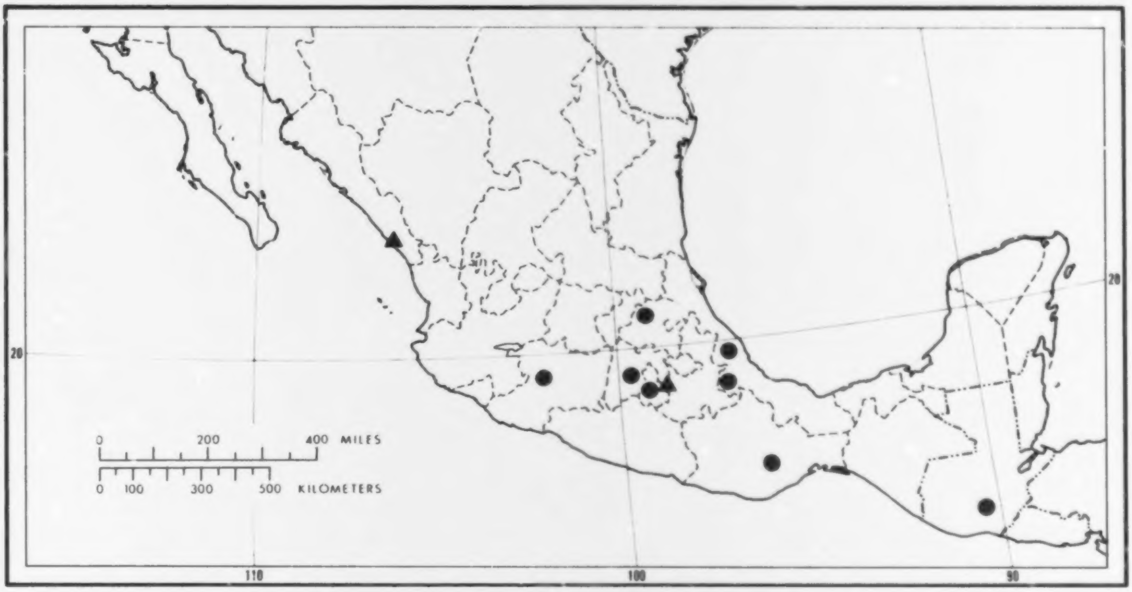


FIGURE 258.—Distribution of *Lasioglossum aequatum* (triangle) and *L. circinatum* (circle).

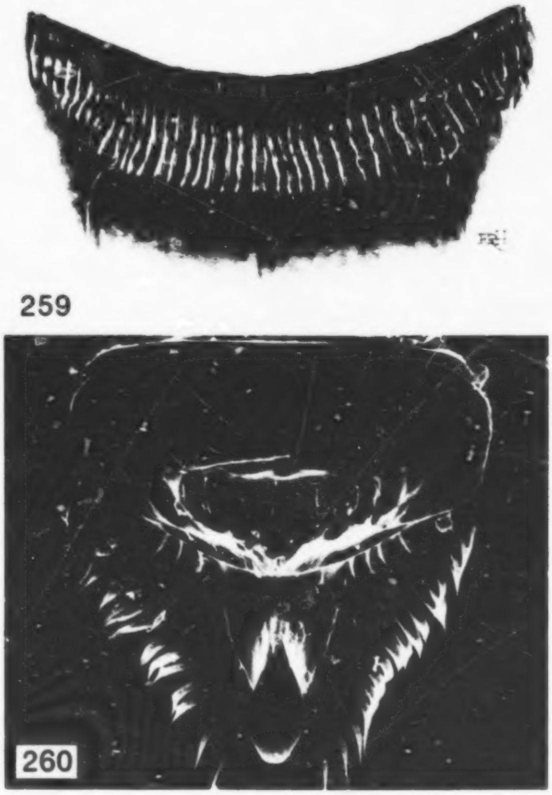
DESCRIPTION.—FEMALE: (1) Length 7.9–8.9 mm (x̄ = 8.3, n = 3); (2) wing length 2.2–2.4 mm (x̄ = 2.3, n = 3); (3) abdominal width 2.5–2.6 mm (x̄ = 2.5).

Structure: (4) Head short (similar to Figure 303; length/width ratio 0.83–0.92, x̄ = 0.88, n = 3). (7) Supraclypeal area evenly rounded, (8) weakly protuberant. (9) Clypeus projecting approximately 0.78 of its length below lower margin of eyes; (11) surface with weakly developed median longitudinal sulcation. (14) Distance between lateral ocelli subequal to distance between lateral ocellus and eye. (23) Flagellomere 1 subequal to 2 in length along dorsal surface. (27) Labral distal keel broad in frontal view, spoon-shaped with conspicuous basal, median groove; (28) distal lateral projections absent; (29) fimbrial setae acutely pointed.

(32) Pronotal lateral angle narrowly obtuse, sharply pointed; (33) pronotal lateral ridge incomplete, interrupted by oblique lateral sulcus; (34) lower portion of lateral ridge narrowly rounded. (35) Mesoscutal lip weakly bilobed, (36) moderately elevated from pronotum. (40) Dorsal surface of propodeum about 0.74 the length of scutellum and about 1.3 times the length of metanotum, (41) slightly depressed centrally, (42) posterior margin very broadly rounded; (43) propodeal triangle weakly defined, median V-shaped elevation inconspicuous; (44) lateral carinae extending to dorsal surface, becoming weakly defined along dorsal edge. (45) Tibial spur as in Figure 16.

(46) Lateral edge of metasomal tergum II weakly sinuate.

Sculpture: (47) Face shiny, (48) densely and uniformly punctate between ocelli and antennae, punctures contiguous. (51) Supraclypeal area extremely granulate; (52) punctation sparse and scattered. (53) Clypeus granulate throughout; (54) punctures separated by their width or less basally, slightly less dense apically. (56) Mesoscutum moderately shiny; (57) punctures coarse, contiguous to nearly contiguous throughout, interspaces granulate, becoming obscurely scabrous anteriorly. (58) Scutellum densely punctate throughout, punctures adjacent to median line coarse, similar to those of mesoscutum. (63) Dor-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FIGURES 259, 260.—*Lasioglossum aequatum*, female: 259, propodeum; 260, labrum.

sal surface of propodeum (Figure 259) strongly and regularly striate, striae reaching posterior margin; (64) surface not noticeably alveolated. (65) Metasomal tergum I moderately shiny; (66) surface granuloso-punctate.

Coloration: (71) Wing membrane mostly hyaline, marginal cell and apex infuscated.

Vestiture: (74) Pubescence of head pale yellowish brown. (75) Pubescence of thorax pale yellowish brown; (76) mesoscutal hairs moderately dense and plumose. (77) Hind tibial hair color differentiated, most hairs white, dorsal hairs light to dark brown. (78) Anterior hairs of metasomal tergum I white, (79) basal hair bands of terga II–IV yellowish white. (80) Acarinarium absent, elongate hairs scattered over anterior surface of tergum I.

SPECIMENS EXAMINED.—3♀.

MEXICO. HIDALGO: El Chico, 23 Sep 1938, L.J. Lipovsky (1♀; KU). MEXICO: Mexico City, 38 mi SE, 26 Apr 1965, 9000–9500 ft, on *Senecio sylvaticus,* H.V. Weems, Jr. (1♀; FSCA). SINALOA: Mazatlan, Mar 1883 (1♀; NMW).

3. *Lasioglossum argutum*, new species

FIGURES 18, 261–273

TYPE MATERIAL.—The female holotype is in the Snow Museum, University of Kansas, Lawrence. It is labeled

7 mi SE Nochixtlan Oaxaca Mexico VII [Jul] 5 1953 6700 ft/Univ. Kans.[as] Mex.[ican] Expedition/Nolina Taken on/ HOLOTYPE Lasioglossum argutum R.J. McGinley [red label].

One hundred fifteen female paratypes and 33 male paratypes are designated and listed in the "Specimens Examined" section below.

ETYMOLOGY.—The specific epithet is derived from the Greek *argutus* (clear or bright), a reference to the conspicuously shiny dorsal propodeal surface characteristic of this species.

DISTRIBUTION (Figure 261).—*Lasioglossum argutum* is presently known from south-central Mexico from San Luis Potosi south to Oaxaca.

DIAGNOSIS.—Both sexes of *L. argutum* can be recognized by the smooth, highly polished posterior one-third to one-half of the dorsal propodeal surface (Figure 266). *Lasioglossum bajaense* has a similar propodeum but is known only from Baja California, has a large metasomal acarinarium (absent in *L. argutum*), and has relatively sparse mesoscutal punctation (the mesoscutum of *L. argutum* is obscurely doubly-punctate with the smaller punctures nearly contiguous, Figure 267). Other characters helpful in recognizing both sexes of *L. argutum* are the short head (Figures 262, 263) and the complete pronotal lateral carina (see Figure 9).

DESCRIPTION.—FEMALE: (1) Length 7.1–8.6 mm ($\bar{x} = 8.0$, $n = 15$); (2) wing length 2.2–2.5 mm ($\bar{x} = 2.4$, $n = 15$); (3) abdominal width 2.4–2.7 mm ($\bar{x} = 2.5$, $n = 15$).

Structure: (4) Head short (Figure 262; length/width ratio 0.84–1.0, $\bar{x} = 0.89$, $n = 15$).

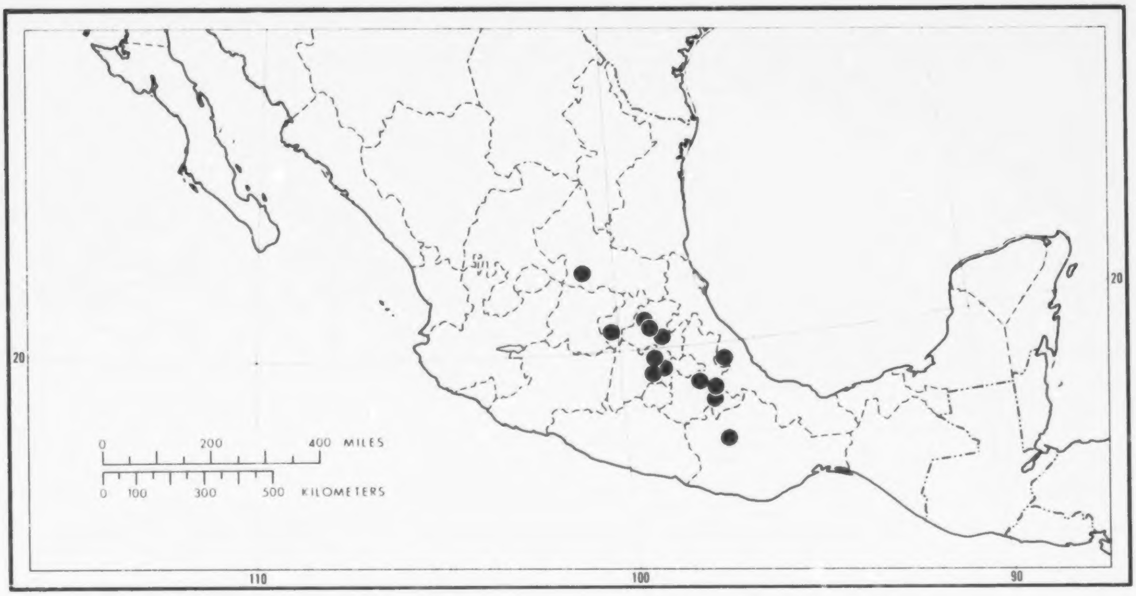


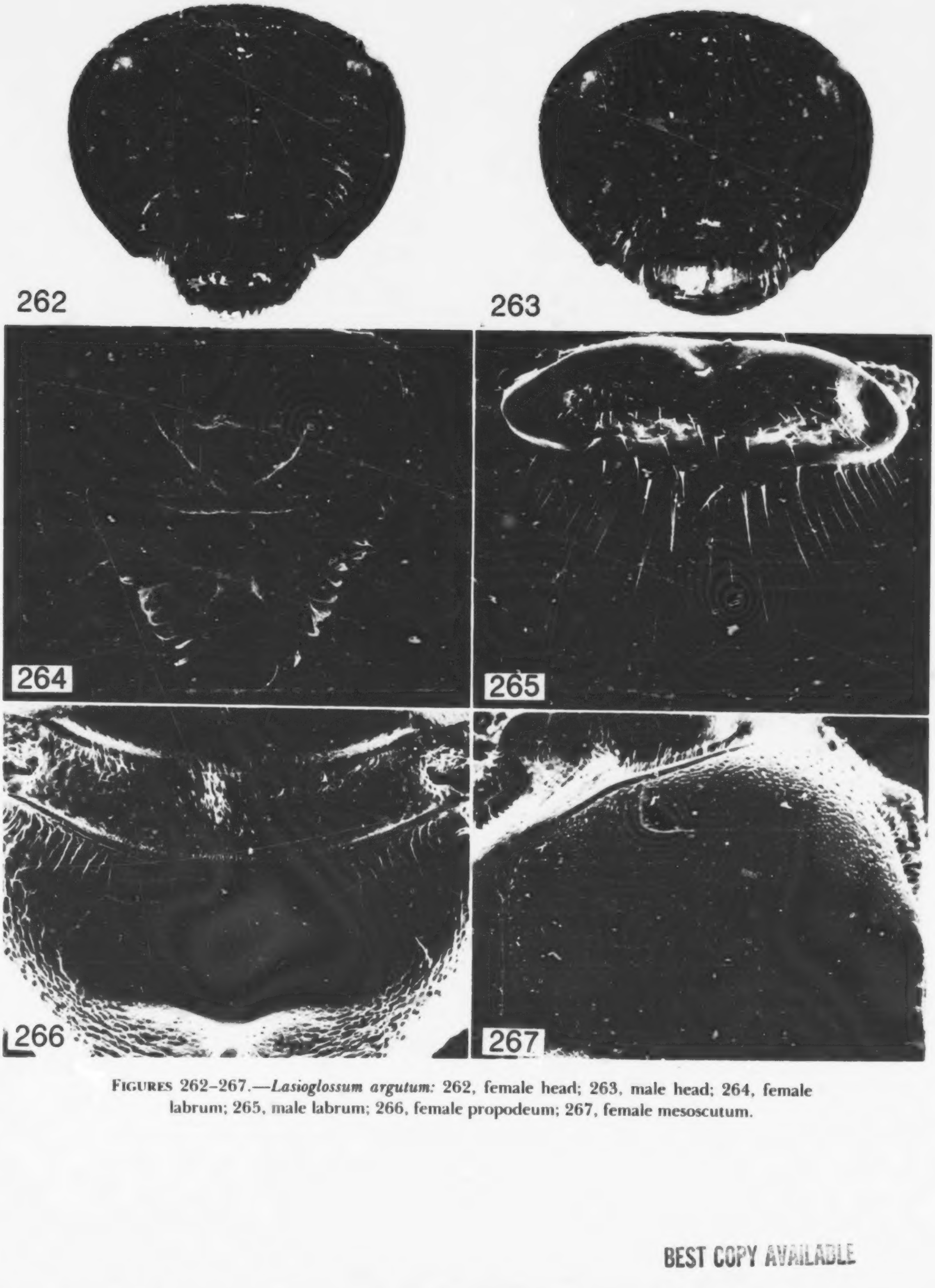
Figure 261.—Distribution of *Lasioglossum argutum.*

(7) Supraclypeal area evenly rounded, (8) moderately protuberant. (9) Clypeus projecting approximately 0.73 of its length below lower margin of eyes; (11) surface with distinct median longitudinal sulcation. (14) Distance between lateral ocelli subequal to distance between lateral ocellus and eye. (23) Flagellomere 1 subequal to 2 in length along dorsal surface. Labrum as in Figure 264; (27) distal keel extremely broad in frontal view, widest basally; (28) distal lateral projections small, narrowly rounded; (29) fimbrial setae acutely pointed.

(32) Pronotal lateral angle forming right angle; (33) pronotal lateral ridge appearing complete, indistinctly notched by obscure oblique lateral sulcus; (34) lower portion of lateral ridge sharply edged. (35) Mesoscutal lip weakly bilobed, (36) moderately elevated from pronotum. (40) Dorsal surface of propodeum about 0.86 the length of scutellum and about 1.5 times the length of metanotum, (41) very slightly depressed centrally, (42) posterior margin rounded; (43) propodeal triangle very weakly defined, evident medially as a very low, inconspicuous V-shaped elevation without lateral rims; (44) lateral carinae extending to about midpoint of posterior surface. (45) Tibial spur as in Figure 18.

(46) Lateral edge of metasomal tergum II broadly and shallowly concave.

Sculpture: (47) Face shiny, (48) densely and uniformly punctate between ocelli and antennae, punctures contiguous. (51) Supraclypeal area extremely granulate; (52) punctation very sparse with few, scattered punctures. (53) Clypeus granulate basally, apical two-thirds polished; (54) punctures very sparse, obscure, apicolateral areas virtually impunctate. (56) Mesoscutum moderately shiny; (57) punctation as in Figure 267, obscurely doubly-punctate, smaller punctures dense, contiguous or nearly contiguous throughout, larger punctures obscure, separated by 3–4 times their width. (58) Scutellum doubly punctate throughout, smaller punctures separated by their width or slightly less, larger punctures scattered. (63) Dorsal surface of propodeum (Figure 266) striolate laterally and over basal two-thirds medially, posterior third smooth and conspicuously polished; (63) posterior half smooth, not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FIGURES 262–267.—*Lasioglossum argutum:* 262, female head; 263, male head; 264, female labrum; 265, male labrum; 266, female propodeum; 267, female mesoscutum.

alveolated. (65) Metasomal tergum I moderately shiny; (66) punctation fine, dense, punctures slightly less than their width apart.

Coloration: (71) Wing membrane hyaline.

Vestiture: (74) Pubescence of head white on gena and near antennae, becoming pale yellowish brown on vertex. (75) Pubescence of thorax white; (76) mesoscutal hairs moderately dense and plumose. (77) Hind tibial hair color weakly differentiated, most hairs white to pale yellowish brown, dorsal hairs brown basally. (78) Anterior hairs of metasomal tergum I and (79) basal hair bands of terga II–IV white. (80) Acarinarium absent, elongate hairs scattered over anterior surface of tergum I.

MALE: Similar to female except as follows: (1) length 6.4–8.7 mm ($\bar{x}$ = 7.5, n = 10); (2) wing length 1.9–2.3 mm ($\bar{x}$ = 2.1, n = 10); (3) abdominal width 1.7–2.0 ($\bar{x}$ = 1.9, n = 10). (4) Head as in Figure 263 (length/width ratio 0.82–0.96, $\bar{x}$ = 0.89, n = 10). (5) Gena subequal to eye in width, (6) moderately produced posteriorly. (11) Clypeal surface shallowly depressed ventrally. Labrum as in Figure 265; (24) distal process weakly developed, rounded; (25) basal area depressed medially; (26) basal lateral depressions conspicuously developed. (30) Mandible moderately elongate, reaching slightly beyond opposing clypeal angle. (53) Clypeus mostly polished, granulate along basal edge; (54) punctures well formed, nearly contiguous along basal edge, apical two-thirds virtually impunctate with very fine widely scattered punctures. (68) Clypeal maculation present (Figure 263). (69) Flagellum entirely dark or slightly paler ventrally than on dorsum. (72) Tarsi dark, concolorous with tibiae.

Vestiture: Sternal vestiture as in Figure 268; (82) hairs on sternum IV moderately elongate, suberect, with conspicuous band of hairs near posterior edge of sternum; (83) sternum V with median rosette of short hairs, posterior sternal edge with conspicuous, broadly rounded lateral hair lobes that are only weakly separated medially.

Terminalia: Sterna VII–VIII as in Figure 272; (85) sternum VIII with extremely elongate, slender median process. Genitalia as in Figures 269–271; (86) gonobase moderately elongate; (87) gonostylus elongate, slender; (88) retrorse membranous lobe present, (89) slender, somewhat narrowly rounded apically; (90) volsella with prominent lateral lobe.

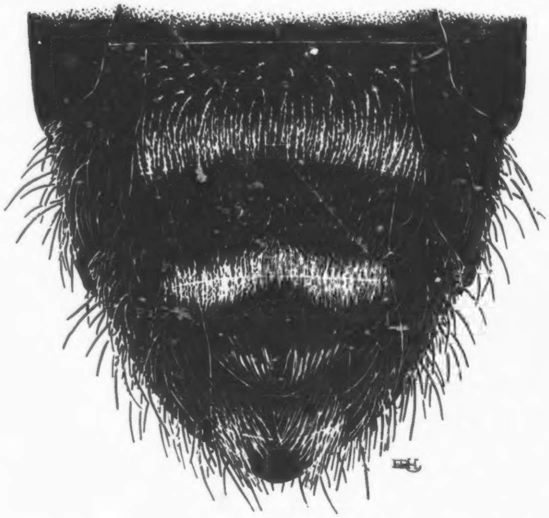


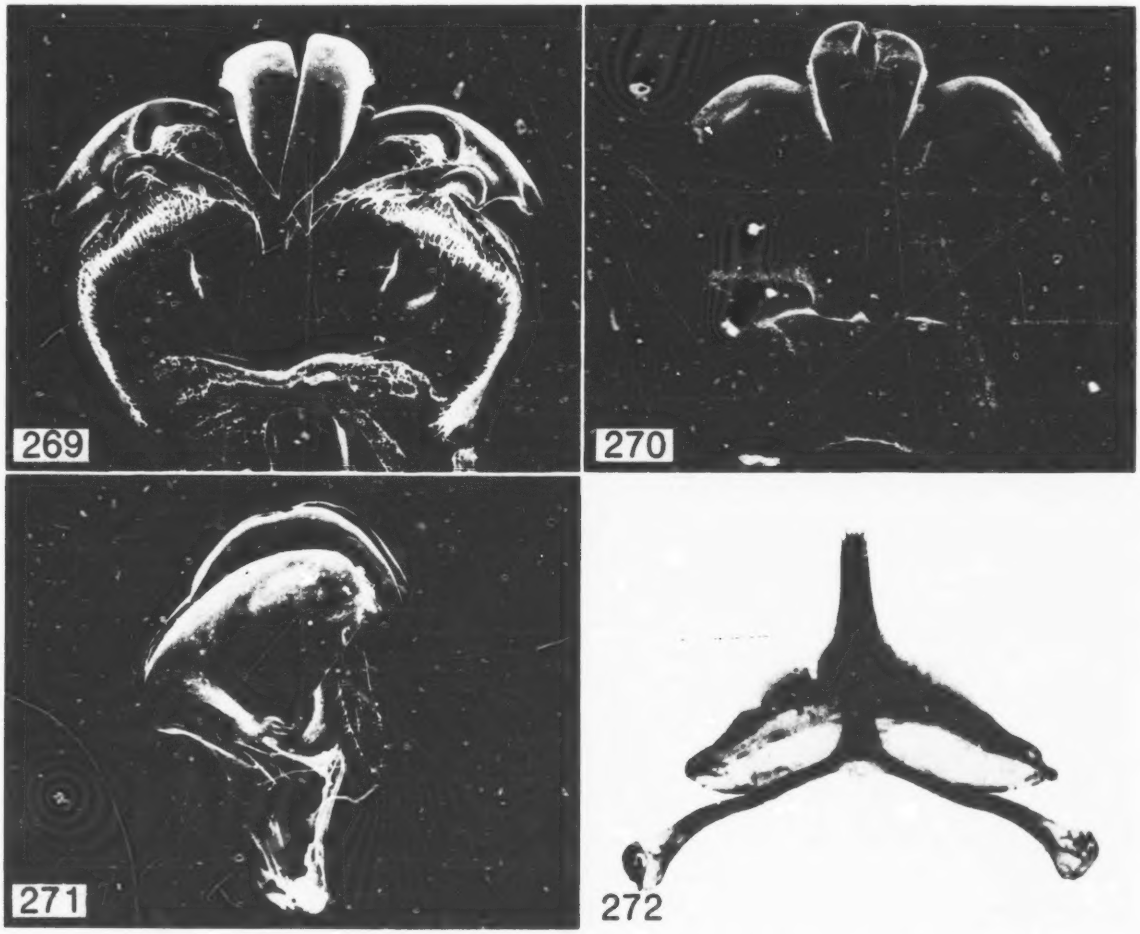
FIGURE 268.—*Lasioglossum argutum*, male sternal vestiture.

FLIGHT RECORDS (Figure 273).—Females have been collected in most months from February through October, with most records from late February, late June, and early July. Most male records are from June but the range is from February and June through October.

FLOWER RECORDS.—Females (25): Liliaceae 44%; Anacardiaceae 32%; Compositae 12%. Males (4): Malvaceae 50%; Anacardiaceae 25%; Compositae 25%. Total: 29 in 6 families, 8 genera as follows:

Baccharis 1♀; *Eupatorium* 2♀; *Flourensia* 1♂; **Gaura* 1(1)♀; *Malva* 1♀, ♂; **Nolina* 11(11)♀, **Opuntia* 1(1)♀; **Schinus* 8♀, 1♂.

MITE ASSOCIATES.—*Lasioglossum argutum* females do not have an acarinarium on the first metasomal tergum; however, five (4.4%) of the 114 females examined had hypopodes on this surface. None of the 31 males examined carried mites.



FIGURES 269–272.—*Lasioglossum argutum*, male: 269, genitalia, ventral view; 270, same, dorsal view; 271, same, lateral view; 272, sterna VII–VII.

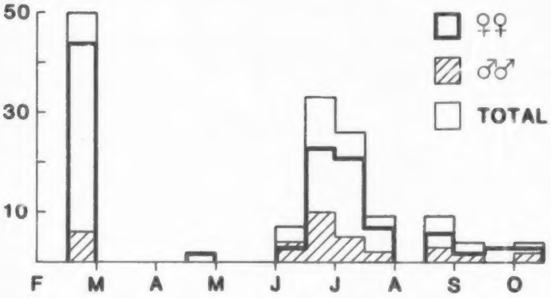


FIGURE 273.—*Lasioglossum argutum* flight records.

SPECIMENS EXAMINED.—149 (116♀, 33♂).

MEXICO. DISTRITO FEDERAL: Los Reyes, 2 km W, 6 Aug 1967, 7500 ft, weeds-Solanaceae, K.W. Brown, M. Irwin (1♂; UCR); Mexico City, 16 Aug 1956, R. & K. Dreisbach (1♂; MSUEL), 6 Jul 1962, D.H. Janzen (1♂; UCB), 16 Aug 1956, R. & K. Dreisbach (1♀; MSUEL), in plane cabin, 8 Oct 1947 (1♂; USNM). HIDALGO; Actopan, 9 mi NW, 1 Sep 1962, 6450 ft, Univ. Kansas Mex. Exped. (1♀, 2♂; KU); Colonia, 26 Feb 1953, R.C. Bechtel, E.I. Schlinger (8♀; UCB); Epazoyucan, 17 Jun 1961, 8100 ft, Univ. Kansas Mex. Exped. (8♀, 2♂; KU); Ixmiquilpan, 5 mi S, 9 Jul 1968, M. Wasbauer, J. Slansky (1♀; UCD); Pachuca, 24 Jun 1953, Univ. Kansas Mex. Exped. (1♀; KU), 28 Jul 1954, Univ. Kansas Mex. Exped. (1♀; KU), 3 mi W, 24 Jun 1953, Univ. Kansas Mex. Exped. (6♀, 1♂; KU), 4 mi W, 17 Jun 1961, 7900 ft. Univ. Kansas Mex. Exped. (2♀; KU), 5 mi W, 25–26 Aug 1962, 7900 ft, Roberts, Naumann, Ellen, Ordway (1♀, 1♂; KU); Pachuca Junction, Route 85, 24 Apr 1965, 8000–8500 ft, H.V. Weems (2♀; FSCA); Teteapulco, 6 km W (25 km E (Otumba), 4 Jul 1948, W.H. Littlewood (1♀; UMMZ); Zimapan, 8 Jul 1968, M. Wasbauer, J. Slansky (3♂; UCD). MEXICO: Temascalapa, 5.8 mi SE, 28 Aug 1962, 8100 ft, Univ. Kansas Mex. Exped. (4♀, 2♂; KU); Teotihuacan 21 Jul 1956, R. & K. Dreisbach (5♀; MSUEL); Teotihuacan Pyramid, 15–16 Jun 1951, H.E. Evans, P.D. Hurd (2♀, 5♂; UCB, KU), 6 Jul 1951, P.D. Hurd (2♀, 1♂; UCB); Texcoco, 11 mi W, 20 Jun 1962, D.H. Janzen (4♀, 3♂; UCB).

OAXACA: Nochixtlan, 5 mi N, 3 Sep 1966, D.E. Breedlove (1♀; CU), 7 mi SE, 5 Jul 1953, 6700 ft, Univ. Kansas Mex. Exped. (11♀, includes Holotype; KU), 10 mi SE, 27 Jun 1961, 7100 ft, Univ. Kansas Mex. Exped. (1♂; KU); Yanhuitlan, 11.4 km N, 20 Sep 1976, 2408 m, C.D. George, R.R. Snelling (3♀; LACM). PUEBLA: Azumbilla, 1.3 mi E, 16 Jul 1965, 6700 ft, C.L. Hogue (1♀; LACM); Morelos Canada, 7 km SE, 4–5 Jul 1974, J. Chemsak, J. Powell (1♀; UCB), 14 km NE, 10 Jul 1974, J. Chemsak, E.G. Linsley, J. Linsley (1♀; UCB); Puebla, 51 mi E, 7 Jun 1956, 6800 ft, H.A. Scullen (1♀; OrS); San Hipolito, 5 Jul 1962, D.H. Janzen (4♀; UCB); Tehuacan, 23 Jun 1951, H.E. Evans, P.D. Hurd (1♀, 2♂; UCB, KU), 11 mi NE, 7 Jun 1956, 6700 ft, H.A. Scullen (1♀; OrS). QUERETARO: Queretaro, 41 mi N, 3 Oct 1963, 6500 ft, Scullen & Bolinger (3♀; OrS). SAN LUIS POTOSI: San Luis Potosi, 20 mi SW, 25 Jun 1962, 6800 ft, Univ. Kansas Mex. Exped. (1♀; KU). VERACRUZ: Perote, 5 mi SW, 29 Feb 1972, F. Parker, D. Miller (36♀, 6♂; USU). UNSPECIFIED LOCALITY: C.F. Baker (1♀; USNM).

4. *Lasioglossum asaphes*, new species

FIGURES 19, 242, 274–280, 282–286

TYPE MATERIAL.—The female holotype of *Lasioglossum asaphes* is deposited in the National Museum of Natural History, Smithsonian Institution. The specimen is labeled

MEXICO, Chis. [Chiapas] SanCristobal [de] las Casas, VII [July]-17-21-[19]64 Paul J. Spangler/HOLOTYPE Lasioglossum asaphes R.J. McGinley [red label].

The holotype is missing the mid left tibia and tarsus but otherwise is in good condition. Sixty female and six male paratypes are listed in the "Specimens Examined" section.

ETYMOLOGY.—The specific epithet is taken from the Greek *asaphes* (obscure, baffling), alluding to the difficulty in distinguishing this somewhat generalized species.

DISTRIBUTION (Figure 274).—*Lasioglossum asaphes* is presently known from 61 females and

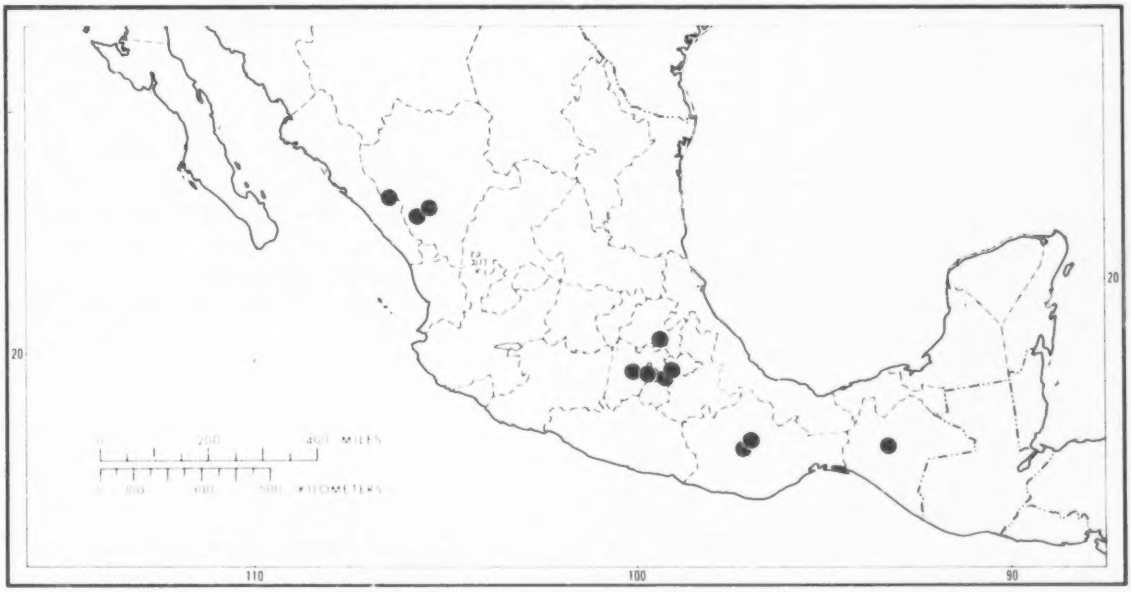
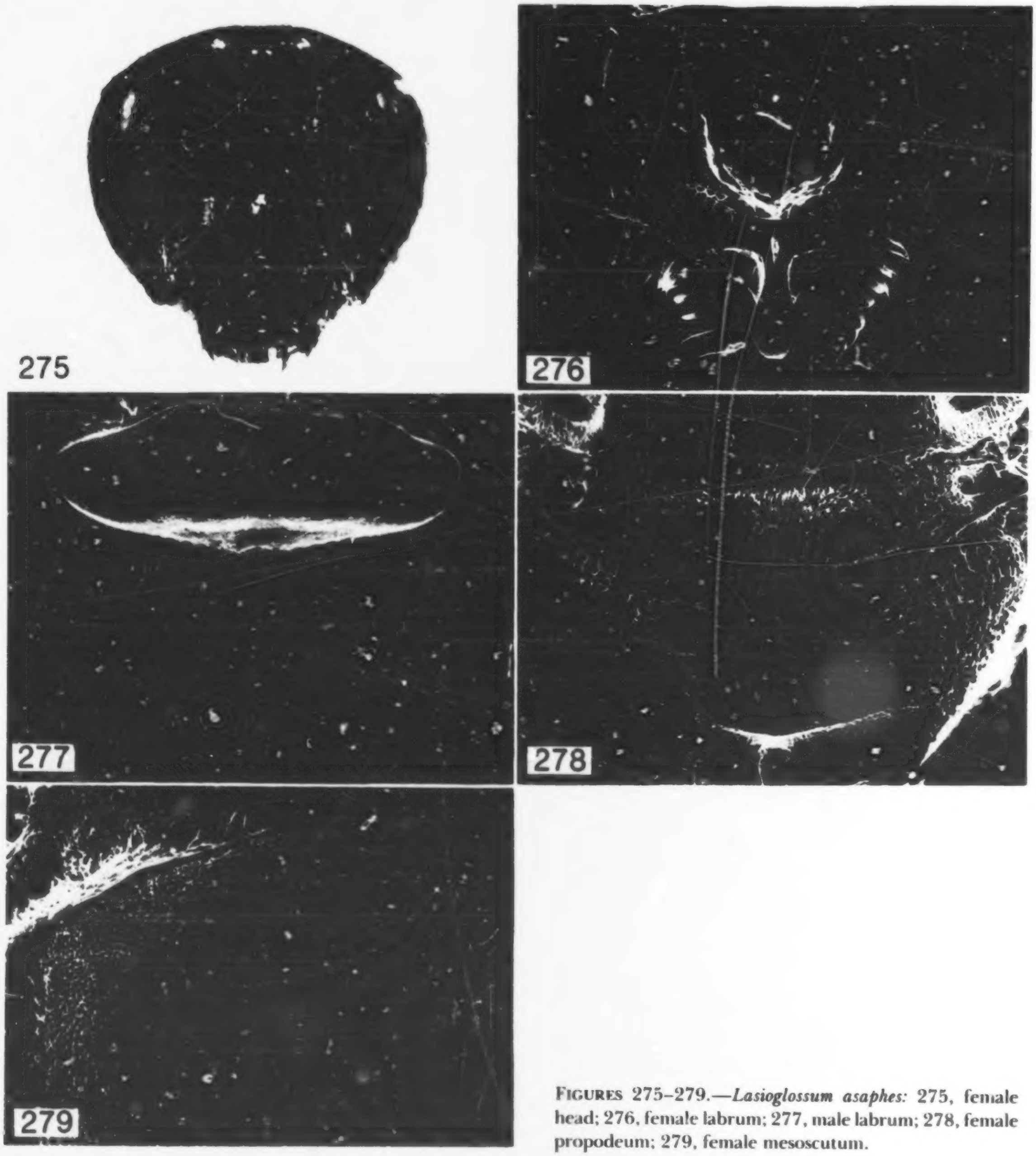


FIGURE 274.—Distribution of *Lasioglossum asaphes*.

six males. It occurs in Mexico from Sinaloa and Durango south to Chiapas.

DIAGNOSIS.—The combination of the entirely granuloso-punctate mesoscutum (Figure 279; not contiguously coarse as in *L. cercothrix* (Figure 313) and *L. aequatum*), the ruguloso-striolate dorsal propodeal surface (Figure 278), the absence of a metasomal acarinarium and lack of



FIGURES 275–279.—*Lasioglossum asaphes:* 275, female head; 276, female labrum; 277, male labrum; 278, female propodeum; 279, female mesoscutum.

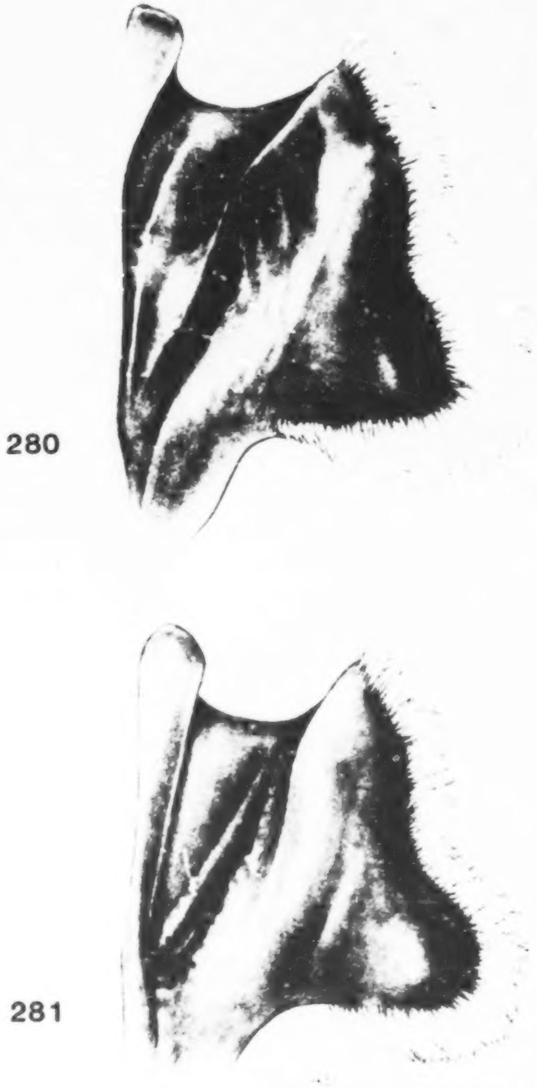
conspicuous infuscation along the anterior edge of the forewing (as in *L. crocoturum*, *L. tricnicos* and *L. eickworti*, Figure 235) will distinguish the females of *L. transvorsum*, *L. asaphes*, *L. xyriotropis*, *L. costale*, and *L. manitouellum* from other New World *Lasioglossum*. *Lasioglossum transvorsum* differs from the above species in having an elongated, V-shaped posterior propodeal margin (Figure 650) and characteristic adpressed hair patches on the anterior surface of tergum I. *Lasioglossum asaphes* and *L. xyriotropis* differ from the latter three species in having a complete pronotal lateral carina (not distinctly interrupted as in Figure 281). The pronotal carina of *L. xyriotropis* is obviously complete (Figure 732), whereas that of *L. asaphes* appears to be almost interrupted by a deep, oblique, lateral sulcus (Figure 280). Furthermore, the head of *L. xyriotropis* is shorter than that of *L. asaphes* and the clypeus of the former species is strongly granulate throughout (apical half shiny in *L. asaphes*).

Males of *L. asaphes* are similar to the females in pronotal structure and propodeal sculpture. They have erect hair tufts on the lateral edges of sternum V (Figure 242). Among Mexican species, similar hair tufts are found elsewhere in males of *L. tricnicos* and *L. pallicorne*. *Lasioglossum tricnicos* males have the anterior edge of the forewing conspicuously infuscated (hyaline in *L. asaphes*), and the sternal hair tufts of *L. pallicorne* males include some hairs that are conspicuously elongate and curled (Figure 576). Males of *L. xyriotropis* are not known.

DESCRIPTION.—FEMALE: (1) Length 8.2–9.5 mm ($\bar{x}$ = 9.0, n = 15); (2) wing length 2.6–2.9 mm ($\bar{x}$ = 2.7, n = 15); (3) abdominal width 2.6–3.0 mm ($\bar{x}$ = 2.8, n = 15).

Structure: (4) Head elongate (Figure 275; length/width ratio 0.85–1.0, $\bar{x}$ = 0.96, n = 15). (7) Supracylpeal area evenly rounded, (8) moderately protuberant. (9) Clypeus projecting approximately 0.87 of its length below lower margin of eyes; (11) surface with obscure median longitudinal sulcation. (14) Distance between lateral ocelli slightly exceeded by distance between lateral ocellus and eye. (23) Flagellomere 1 subequal to 2 in length along dorsal surface. Labrum as in Figure 276; (27) distal keel very broad in frontal view, spoon-shaped, with conspicuous basal median groove; (28) distal lateral projections extremely well developed, sharply projecting (as in *L. bajaense*); (29) fimbrial setae acutely pointed.

(32) Pronotal lateral angle narrowly obtuse;



FIGURES 280–281.—Female pronota: 280, *L. asaphes*; 281, *L. costale*.

(33) pronotal lateral ridge appearing complete, obscurely notched by narrow oblique lateral sulcus; (34) lower portion of lateral ridge sharply edged near oblique sulcus, becoming narrowly rounded ventrally. (35) Mesoscutal lip very weakly bilobed, (36) moderately elevated from pronotum. (40) Dorsal surface of propodeum about 0.88 the length of scutellum and about 1.7 times the length of metanotum, (41) depressed centrally, (42) posterior margin broadly rounded; (43) propodeal triangle very weakly defined laterally, evident medially as an inconspicuous V-shaped elevation with sharp-edged lateral rims, fading towards metanotum; (44) lateral carinae extending beyond midpoint of posterior surface, obscurely reaching dorsal surface. (45) Tibial spur as in Figure 19.

(46) Lateral edge of metasomal tergum II weakly sinuate.

Sculpture: (47) Face moderately shiny, (48) densely and uniformly punctate between ocelli and antennae, punctures contiguous. (51) Supraclypeal area moderately granulate with small polished central area; (52) punctures separated by 1–2 times their width laterally, impunctate centrally. (53) Clypeus granulate basally, apical half polished; (54) punctures obscure basally, separated by less than their width, larger and less dense on apical half. (56). Mesoscutum moderately shiny; (57) punctation as in Figure 279, punctures extremely dense and contiguous throughout, becoming granuloso-punctate anteriorly. (58) Scutellum densely punctate to granuloso-punctate with small but conspicuous impunctate areas adjacent to median line. (63) Dorsal surface of propodeum (Figure 278) very strongly ruguloso-striolate laterally, becoming rugulose medially, striae and rugulae reaching posterior margin; (64) surface obscurely alveolated. (65) Metasomal tergum I moderately shiny; (66) punctation fine, extremely dense, punctures nearly contiguous.

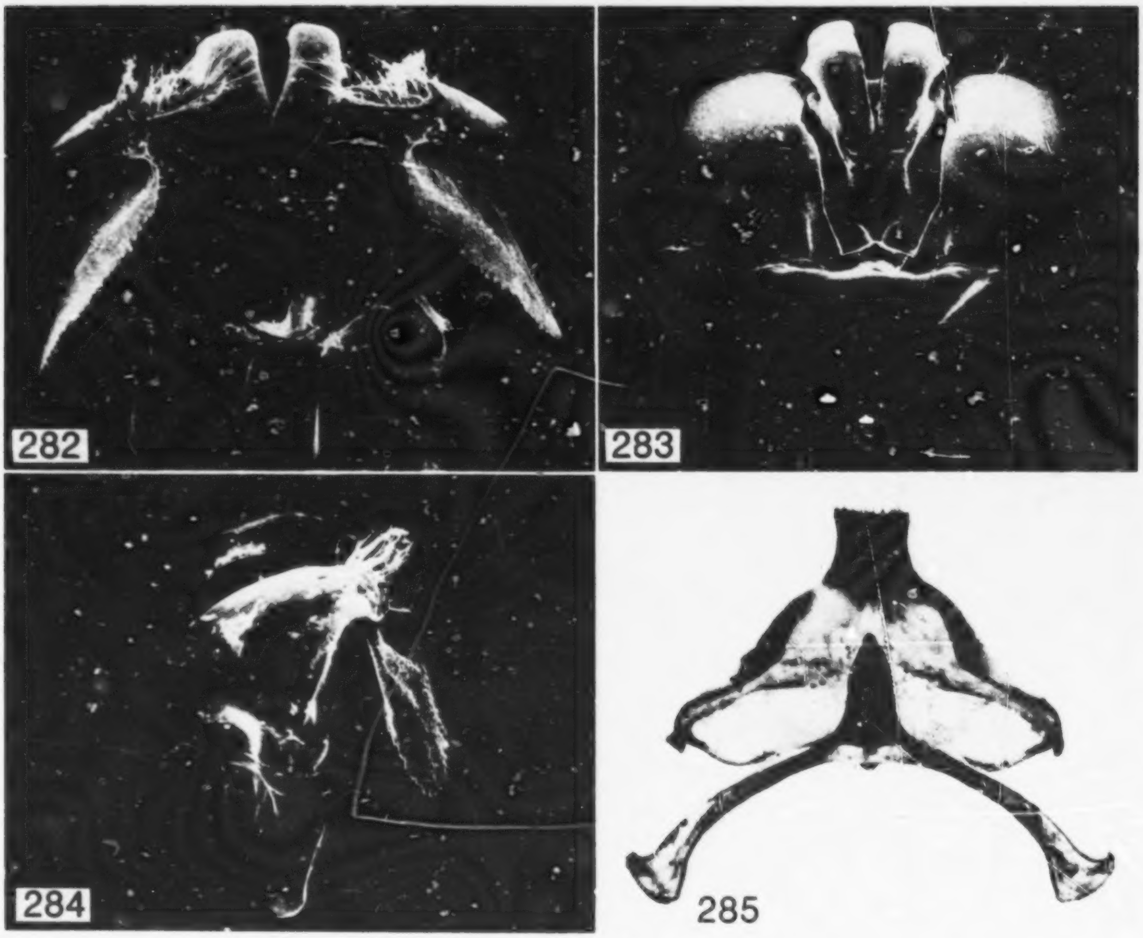
Coloration. (71) Wing membrane mostly hyaline, apex lightly infuscated.

Vestiture: (74) Pubescence of head pale yellowish brown. (75) Pubescence of thorax mostly pale yellowish brown, more brownish on mesoscutum and scutellum; (76) mesoscutal hairs moderately dense and plumose. (77) Hind tibial hair color differentiated, ventral and lateral hairs white, dorsal hairs brown to dark brown. (78) Anterior hairs of metasomal tergum I white, (79) basal hair bands of terga II–IV yellowish white. (80) Acarinarium absent, elongate hairs scattered over anterior surface of tergum I.

MALE: Similar to female except as follows: (1) length 7.3–9.0 mm ($\bar{x}$ = 8.0, n = 7); (2) wing length 2.2–2.5 mm ($\bar{x}$ = 2.3, n = 7); (3) abdominal width 1.9–2.2 mm ($\bar{x}$ = 2.1, n = 7). (4) Head elongate (length/width ratio 0.91–1.0, $\bar{x}$ = 0.98, n = 7). (5) Gena slightly wider than eye, (6) moderately produced posteriorly. (11) Clypeal surface shallowly depressed ventrally. (23) Unlike most species, flagellomere 1 relatively long compared to flagellomere 2 (ratio 1:2 approximately 0.90). Labrum as in Figure 277; (24) distal process very weakly developed, rounded; (25) basal area depressed medially; (26) basal lateral depressions conspicuously developed. (30) Mandible short, just reaching opposing clypeal angle. (53) Clypeus granulate basally, apical two-thirds polished; (54) punctures well-formed, nearly contiguous basally, apical two-thirds with large and small, widely scattered punctures. (68) Clypeal maculation present. (69) Flagellum entirely dark. (72) Tarsi dark, concolorous with tibiae.

Vestiture: Sternal vestiture as in Figure 242; (82) hairs on sternum IV suberect, moderately elongate, becoming elongate laterally; (83) sternum V with median rosette of short hairs that abruptly become elongate and erect laterally, posterior edge of sternum with widely spaced lateral hair lobes.

Terminalia: Sterna VII–VIII as in Figure 285; (85) sternum VIII with truncated, semicircular median process. Genitalia as in Figures 282–284; (86) gonobase moderately elongate; (87) gonostylus elongate, moderately broad, apex broadly rounded; (88) retrorse membranous lobe present (89) moderately broad (unlike other species except *L. tranvorsum*, apex of gonocoxite near base of retrorse lobe with moderately long, medially directed membranous flap); (90) volsella with prominent lateral lobe.



FIGURES 282–285.—*Lasioglossum asaphes*, male: 282, genitalia, ventral view; 283, same, dorsal view; 284, same, lateral view; 285, sterna VII–VIII.

FLIGHT RECORDS (Figure 286).—Females of *L. asaphes* have been collected from late March to early November, with most records from late July (the November records are from Oaxaca). Males have been collected in July and August.

FLOWER RECORDS.—One pollen-laden female taken from *Penstemon gentianoides* in Oaxaca, Mexico.

SPECIMENS EXAMINED.—67 (61♀, 6♂).

MEXICO. CHIAPAS: San Cristobal de las Casas, 2 Aug 1956, J.W. MacSwain, D.D. Linsdale (1♀; CAS), 17–21 Jul

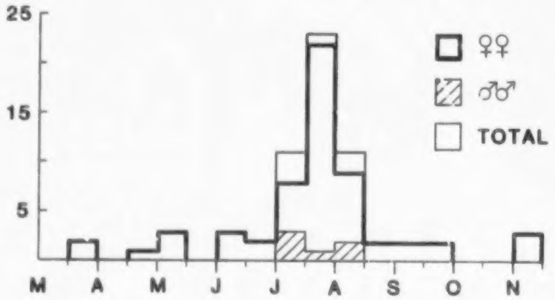


FIGURE 286.—*Lasioglossum asaphes* flight records.

1964, P.J. Spangler (1♀; USNM), 7 mi E, 1 Aug 1952, E.E. Gilbert, C.D. MacNeil (1♀; UCB), 8 mi SE, 10 Jul 1956 (2♀; UCB, CAS), 8–9 mi E, 31 Jul–5Aug 1957, J.A. Chemsak, B.J. Rannells (2♀; CAS, UCB), 10 mi NE, 13 May 1969, 7500 ft, H.J. Teskey (1♀; CNC). DISTRITO FEDERAL: Mexico City, 8 mi W, 15 Jul 1953, 9050 ft, Univ. Kansas Mex. Exped. (1♂; KU). DURANGO: Buenos Aires, 10 mi W La Ciudad, 21 Apr–9 May, 1961, Howden & Martin (3♀; CNC); Durango, 21 mi W, 18 Jul 1964, 7800 ft, J.A. Chemsak (1♀; UCB), 30 mi W, 6 Jun 1964, 7500 ft, W.R.M. Mason (3♀; CNC); El Salto, 10 mi W, 19 Jun 1964, 9000 ft, W.R.M. Mason (1♀; CNC); La Ciudad, 3 mi W, 17 Aug 1972, 8700 ft, MacNeill & Powell (1♀; UCB), 8 mi W, 2 Aug 1964, 8700 ft, J. Powell (1♀; UCB); Las Adjuntas, 1 Jul 1952, J.D. Lattin (1♀; UCB); Tepalcates, 30 mi W Durango, 4–8 Aug 1972, black & white lights, 8400 ft, J. Powell, D. Veirs, C.D. MacNeill (1♀; UCB). HIDALGO: El Chico, Pachuca, 11 Jul 1937, Mead & Embury (1♀; KU), 23 Sep 1938, L.J. Lipovsky (1♀; KU). JALISCO: N slopes Nevado de Colima, pine-fir above Piedra Ancha, 31 Mar 1951, 2700 m, Hoover (1♀; UMMZ).

MEXICO: Agua Bendita, 2 Aug 1962, 9700 ft, H.E. Evans (2♀; MCZ); Amecameca, 7.5 mi SE, 1 Jul 1961, 9600 ft, G.W. Byers (1♂; KU); Popocatepetl, W slope, 5 Jul 1951, 9600 ft, P.D. Hurd (1♀; UCB), 31 Mar 1959, 10,000 ft, H.E. Evans (1♀; CU); Toluca, 15.5 mi E, 6 Jul 1961, 9500 ft, Univ. Kansas Mex. Exped. (3♀, 1♂; KU), 6 Aug 1962, Byers & Naumann (1♀; KU), 16 mi E, 31 Jul 1962, 9500 ft, Univ. Kansas Mex. Exped. (12♀, 1♂; KU), 18 km SW, 7 Sep 1975, B. Villegas (2♀, UCD). MORELOS: Lagunas de Zempoala, 11 Aug 1962, 9200 ft, H.E. Evans (1♀; MCZ). OAXACA: Guelatao, 22 km NE, 19 Sep 1976, on *Penstemon gentianoides*, C.D. George, R.R. Snelling (1♀; LACM); Oaxaca, 20 Jul 1937, Mead & Embury (1♀; KU); Sierra Juarez, 76 mi S Tuxtepec, 6 Nov 1963 (3♀; KU). PUEBLA: Mexico City, 40 mi E, 7 Sep 1957, 9900 ft, H.A. Scullen (2♀; OrS); Puebla, 25 mi W, 24 Jun 1961, D.H. Janzen, (1♀; UCB); San Martin Texmelucan, 15 mi NW, 26 Jul 1963, Naumann & Willis (6♀; KU). SINALOA: Guadalupe de Los Reyes, 20 mi E, 22 Aug 1963, F.D. Parker, L.A. Stange (1♀; UCD). UNCERTAIN LOCALITY: Prto. de las Cruces, 1 Aug 1962, 10,000 ft, H.E. Evans (2♂; MCZ).

5. *Lasioglossum athabascense* (Sandhouse)

FIGURES 20, 287–299

Halictus athabascensis Sandhouse, 1933:78 [male, female].—Brittain and Newton 1934:262 [flower records].

Lasioglossum athabascense.—Michener, 1951:1166 [Nearctic catalog].—Mitchell, 1960:340 [key, redescription, locality data, flower records].—Knerer and Atwood, 1962:162 [locality data, flower records, Ontario].—Hurd, 1979: 1957 [Nearctic catalog].—Hansen and Osgood, 1983:150 [flower records: *Rubus*].

TYPE MATERIAL.—The male holotype is labeled

70 mi. up Athabasca R[iver] Alta (Alberta]/Mer[ritt] Cary Collector/Type No. 44882 U.S.N.M. [red label]/Halictus athabascensis Sandhouse Type [handwritten].

The holotype is in excellent condition and is in the National Museum of Natural History, Smithsonian Institution. Sandhouse designated an allotype and 38 paratypes (15 females, 23 males). The paratypes are in the collections of the National Museum of Natural History (NMNH; including allotype), University of California, Riverside, and the Canadian National Collection. One female paratype from Kaslow, British Columbia, was misassociated in the original series and is actually a specimen of *L. egregium* (Vachal).

DISTRIBUTION (Figure 287).—This transcontinental species, which ranges from Nova Scotia and Prince Edward Island to the Pacific Coast, has the most northern known distribution of New World *Lasioglossum*. In the West it ranges from Fort Simpson, Northwest Territories (61°46′ north latitude) south through the Cascade Range to Oregon and through the Rocky Mountains to Colorado and Utah. The most southern known eastern localities are in southern Pennsylvania. Hurd (1979), based on Mitchell (1960), reported *L. athabascense* from Ohio and south to North Carolina. Mitchell's records from Virginia and North Carolina are most likely based on misidentifications of *L. coriaceum* and *L. forbesii*, sensu lato.

DIAGNOSIS.—Females of this nondescript species are best characterized by the following character combination: acarinarium absent (elongate hairs scattered over anterior surface of metasomal tergum I); dorsal surface of propodeum irregularly striolate to rugulose (Figure 292); head moderately short (Figure 288, length/width ratio 0.92–0.97, $\bar{x}$ = 0.95, n = 14, Fort Simpson, N.W.T.; 0.94–0.98, $\bar{x}$ = 0.96, n = 20, Ithaca, N.Y.).

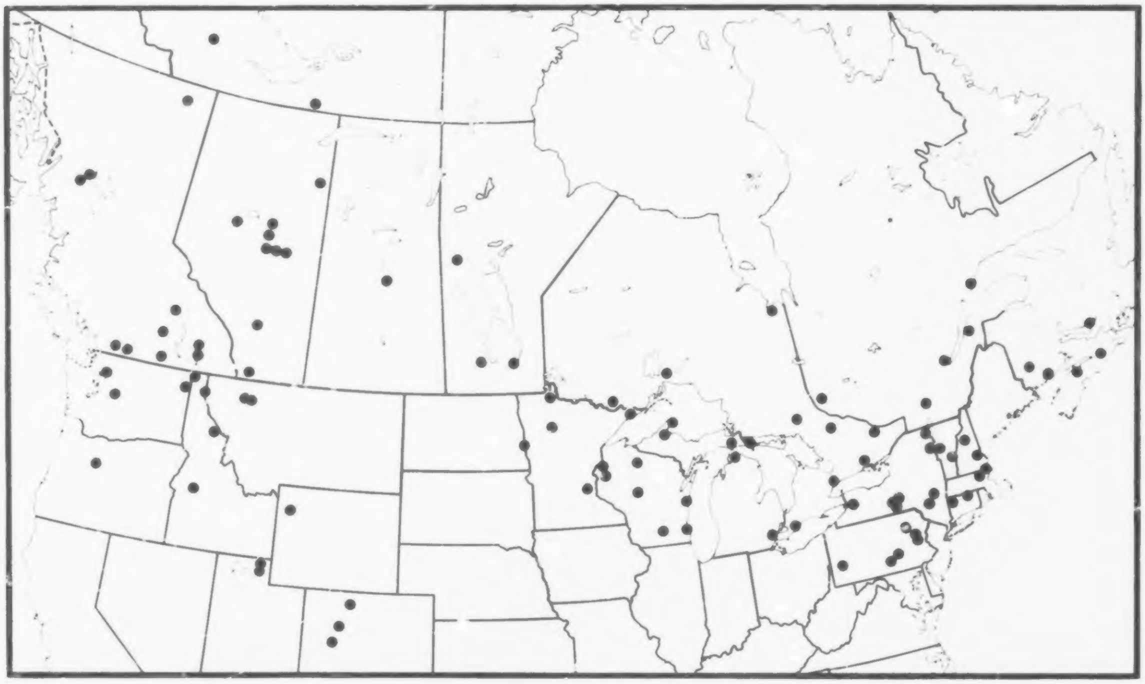


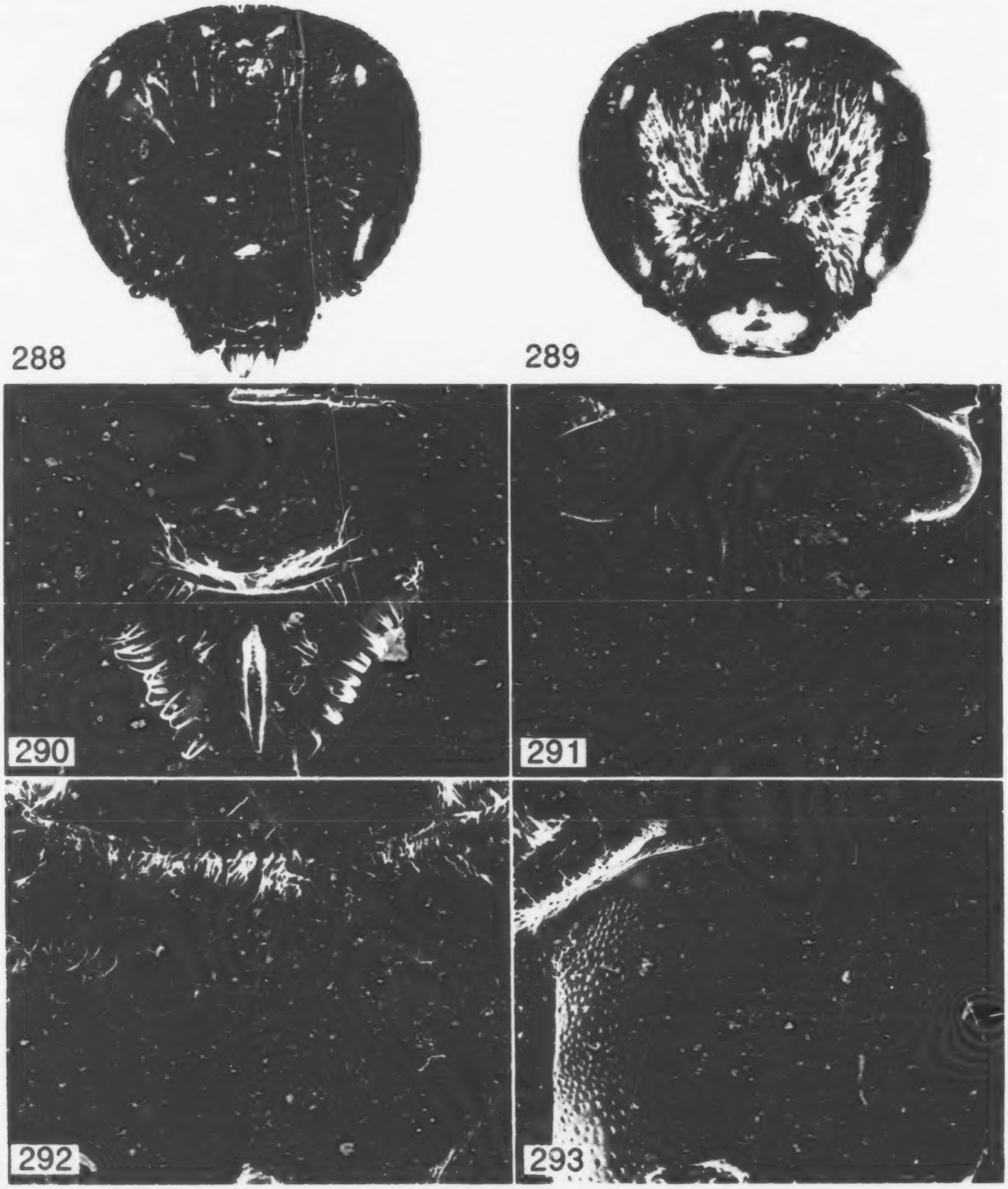
FIGURE 287.—Distribution of *Lasioglossum athabascense.*

In the central and eastern portions of its range, *L. athabascense* females are commonly confused with those of *L. coriaceum* and *L. forbesii* (sensu lato). The presence of an acarinarium in the latter two species (Figures 72, 407–409) easily separates them from *L. athabascense.* Another common eastern species, *L. fuscipenne,* also lacks an acarinarium but can be immediately identified by its distinctive propodeum that is truncated posteriorly and uniquely sculptured (Figure 448). In the West the diagnostic character combination will separate *L. athabascense* from other *Lasioglossum* except for *L. manitouellum, L. lampronotum, L. colatum,* and *L. anhypops. L. manitouellum* is easily differentiated by its granulosopunctate mesoscutum (Figure 510). The conspicuously wide head of *L. lampronotum* (Figure 486), the deeply excavated lateral margin of metasomal tergum II of *L. anhypops* (Figure 154), and the short, adpressed hair patches on metasomal tergum I of *L. colatum* (Figure 84) will readily distinguish these species from *L. athabascense.*

Lasioglossum athabascense males can be recognized by the distinctive hair pattern on sternum V (Figure 294): from the median line, short hairs gradually and evenly increase in length to form elongate lateral hair tufts. Other *Lasioglossum* males in the United States having similar hair tufts are *L. egregium* and *L. mellipes,* which differ from *L. athabascense* by having elongate heads (Figures 684, 698; the head of *L. athabascense* is short and rounded, Figure 289). In eastern United States *L. athabascense* males are often confused with *L. forbesii* and *L. paraforbesii,* but the yellow tarsi of the latter two species versus the dark tarsi of *L. athabascense* will easily differentiate these forms.

DESCRIPTION.—FEMALE: (1) Length 8.6–10.7 mm ($\bar{x} = 9.6$, $n = 20$); (2) wing length 2.6–3.1 mm ($\bar{x} = 2.8$, $n = 20$); (3) abdominal width 2.7–3.3 mm ($\bar{x} = 3.0$, $x = 20$).

Structure: (4) Head moderately short (Figure 288; length/width ratio 0.88–1.0, $\bar{x} = 0.94$, $n = 34$). (7) Supraclypeal area evenly rounded, (8)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FIGURES 288–293.—*Lasioglossum athabascense:* 288, female head; 289, male head; 290, female labrum; 291, male labrum; 292, female propodeum; 293, female mesoscutum.

moderately protuberant. (9) Clypeus projecting approximately 0.74 its length below lower margin of eyes, (11) median longitudinal sulcation weakly developed to absent. (14) Distance between lateral ocelli subequal to distance between lateral ocellus and eye. (23) Flagellomere 1 slightly shorter than 2 along dorsal surface. Labrum as in Figure 290; (27) distal keel narrow, parallel-sided in frontal view; (28) distal lateral projections well developed, triangular; (29) fimbrial setae acutely pointed.

(32) Pronotal lateral angle narrowly obtuse; (33) pronotal lateral ridge incomplete, interrupted by oblique lateral sulcus; (34) lower portion of lateral ridge sharply edged. (35) Mesoscutal lip weakly bilobed, (36) moderately elevated. (40) Dorsal surface of propodeum about 0.88 the length of scutellum and about 1.4 times the length of metanotum, (41) slightly depressed centrally, (42) posterior margin broadly rounded; (43) propodeal triangle weakly defined, median V-shaped portion inconspicuous to weakly elevated, lateral rims absent; (44) lateral carinae extending to midpoint of posterior surface or only slightly beyond. (45) Tibial spur as in Figure 20.

(46) Lateral edge of metasomal tergum II weakly sinuate.

Sculpture: (47) Face shiny, (48) densely punctate below ocelli, punctures contiguous, becoming larger and less dense near antennae. (51) Supraclypeal area usually moderately granulate (polished towards center in some specimens), (52) punctation nearly uniform, punctures 1–2 times their width apart laterally, becoming sparsely punctate centrally. (53) Clypeus granulate basally and most of median area to apex, polished laterally; (54) punctures well formed basally, separated by less than their width, becoming larger, obscure and less dense apically, apicolateral areas largely impunctate. (56) Mesoscutum moderately shiny; (57) punctation as in Figure 293, punctures separated by their width or less laterally and anteriorly (often contiguously punctate along anterior edge), becoming more sparsely punctate centrally, punctures separated by 1–4 times their width. (58) Scutellar punctation nearly uniform, punctures finer and less dense than those of central area of mesoscutum. (63) Dorsal surface of propodeum variable in sculpture, irregularly striolate to rugulose (Figure 292); (64) surface smooth, not alveolated. (65) Metasomal tergum I moderately shiny; (66) punctation fine, moderately dense, punctures 1–1.5 times their width apart.

Coloration: (71) Wing membrane very light yellowish brown.

Vestiture: (74) Pubescence of head pale yellowish brown. (75) Pubescence of thorax mostly pale yellowish brown, white on pronotal lateral angle, pronotal lobe and metanotum; (76) mesoscutal hairs moderately sparse and plumose. (77) Hind tibial hairs concolorous, yellowish brown. (78) Anterior hairs of metasomal tergum I white to pale yellowish brown, (79) basal hair bands of terga II–IV white to yellowish white; (80) acarinarium absent, elongate hairs scattered over anterior surface of tergum I.

MALE: Similar to female except as follows: (1) length 7.4–9.2 mm ($\bar{x} = 8.1$, $n = 20$); (2) wing

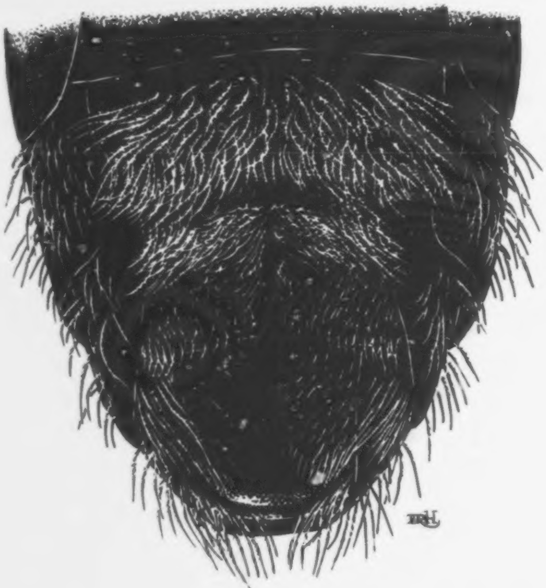
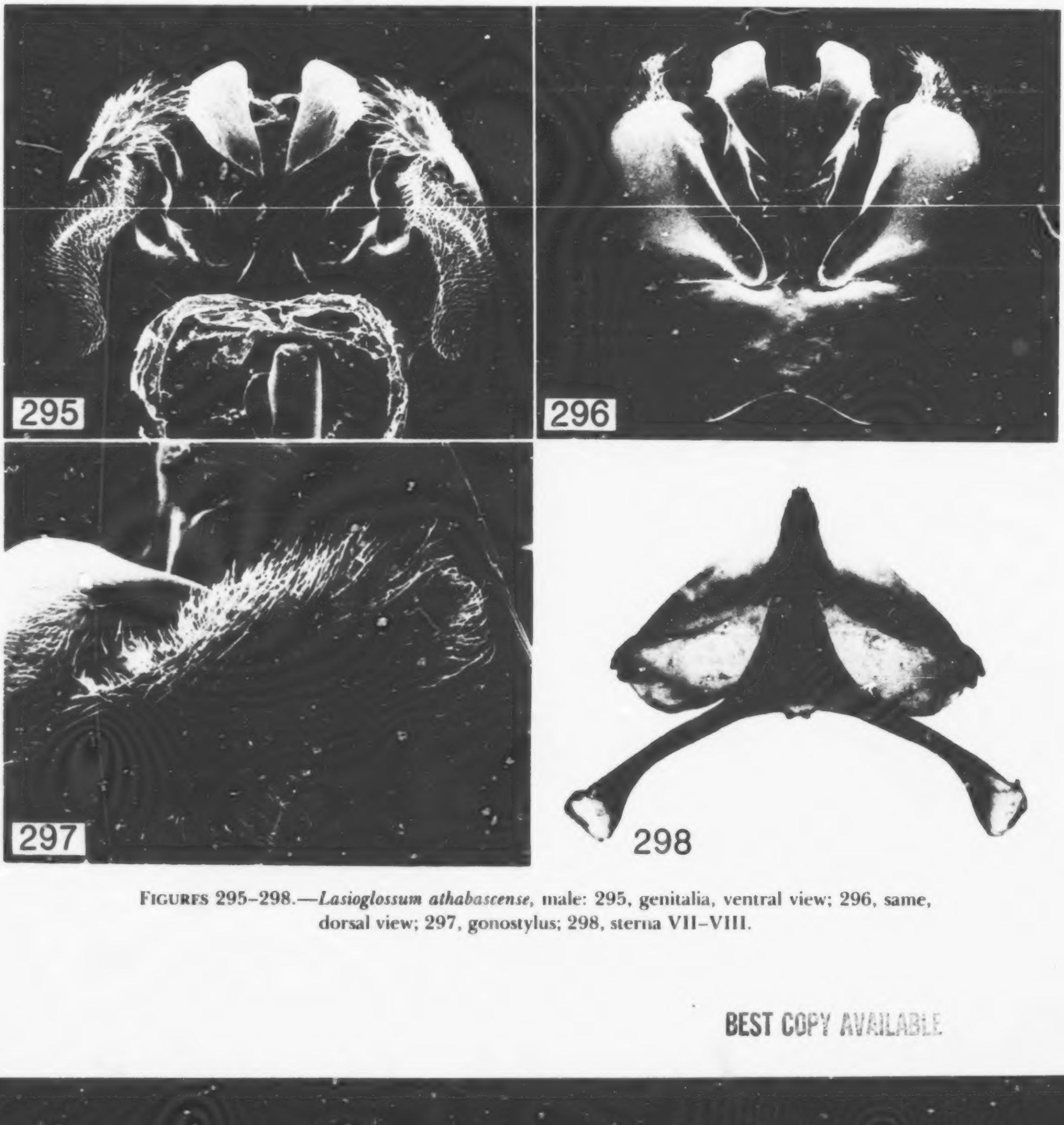


FIGURE 294.—*Lasioglossum athabascense* male sternal vestiture.

length 2.1–2.7 mm ($\bar{x} = 2.4$, $n = 20$); (3) abdominal width 2.0–2.5 mm ($\bar{x} = 2.2$, $n = 20$). (4) Head as in Figure 289 (length/width ratio 0.91–1.0, $\bar{x} = 0.95$, $n = 20$). (5) Gena subequal to eye in width, (6) moderately produced posteriorly. (11) Clypeal surface shallowly depressed ventrally. Labrum as in Figure 291; (24) distal process absent; (25) basal area depressed medially; (26) basal lateral depressions very weakly developed, inconspicuous, nearly flat areas. (30) Mandible short, just reaching opposing clypeal angle. (53) Clypeus polished; (54) punctures well formed along basal edge, becoming very fine and scattered over apical two-thirds. (68) Clypeal maculation present (Figure 289). Flagellum pale yellowish orange ventrally, contrasting strongly with dark dorsal surface. (72) Tarsi dark, concolorous with tibiae.

Vestiture: Sternal vestiture as in Figure 294; (82) hairs on sternum IV dense, elongate, erect; (83) sternum V with median rosette of moderately short, erect hairs that gradually become longer laterally to form erect lateral hair tufts.

Terminalia: Sterna VII–VIII as in Figure 298; (84) unlike most species, median process of sternum VII relatively broad; (85) sternum VIII



FIGURES 295–298.—*Lasioglossum athabascense*, male: 295, genitalia, ventral view; 296, same, dorsal view; 297, gonostylus; 298, sterna VII–VIII.

with short, narrowly rounded median process. Genitalia as in Figures 295–297; (86) gonobase moderately elongate; (87) gonostylus extremely broad, apex broadly triangular; (88) retrorse membranous lobe present, (89) moderately broad, tapering apically; (90) volsella with very prominent lateral lobe.

FLIGHT RECORDS (Figure 299).—Females of *L. athabascense* have been collected from April through early October, with most records from late April through July. Most males have been collected in late August, with records extending from July to October.

FLOWER RECORDS.—Females (58): Rosaceae 47%; Cruciferae 16%; Compositae 12%; Salicaceae 12%. Males (3): Compositae 67%; Balsaminaceae 33%. Total: 61 in 11 families, 18 genera as follows:

Aster 1♂; *Barbarea* 7♀; **Brassica* 2(1)♀; *Chrysothamnus* 1♀; *Eupatorium* 1♂; *Hackelia* 1♀; *Impatiens* 1♂; *Inula* 2♀; *Melilotus* 2♀; *Penstemon* 2♀; *Pyrus* 1♀; **Rubus* 25(18)♀; *Salix* 7♀; *Spiraea* 1♀; *Tamarix* 1♀; *Taraxacum* 4♀; *Vaccinium* 1♀; *Viola* 1♀.

SPECIMENS EXAMINED.—361 (279♀, 82♂).

CANADA. ALBERTA: Athabasca River, 70 mi up, Beverly, Bilby, Calgary, 20 mi W, Edmonton, Evansburg, Fawcett, McMurray, Valleyview, Wabamun, Waterton, Waterways. BRITISH COLUMBIA. Abbotsford, Deroche, Fort Nelson, Hazelton, Kaslo, Manning Park, Mara, Nelson, Osoyoos, Salmon Arm, Steelhead Terrace. MANITOBA: Aweme, Teulon, Treesbank, Wanless. NEW BRUNSWICK: Fredericton, Saint John, 50 mi E Maine border on Route 1. NORTHWEST TERRITORIES: Fort Simpson; Fort Smith. NOVA SCOTIA: Kings County; Smith's Cove; Truro. ONTARIO: Algon Park; Belleville; Black Sturgeon Lake; Donset, Wren Lake: Kenora, 15–19 SE; Lake Superior; MacDiarmid; Moose Factory; Morpeth, S of (on Lake Erie); One Sided Lake; Ottawa; Penage Lake; Quetica Park; Toronto. PRINCE EDWARD ISLAND: Souris. QUEBEC: Andreville; Cap Rouge; Forestville; Laniel; Montreal. SASKATCHEWAN: above Grand Rapids; Waskesiu.

UNITED STATES. COLORADO: *Delta Co.; Garfield Co.; Routt Co.* CONNECTICUT: *Litchfield Co.; Tolland Co.* IDAHO: *Bonner Co.; Clearwater Co.; Valley Co.* MAINE: *Washington Co.* MASSACHUSETTS: *Essex Co.; Middlesex Co.* MICHIGAN: *Cheboygan Co.; Chippewa Co.; Emmet Co.; Houghton Co.; Keweenaw Co.; Mackinac Co.; Wayne Co.* MINNESOTA: *Clearwater Co.; Cook Co.; Hennepin Co.; Roseau Co.* MONTANA: *Flathead Co.* NEW HAMPSHIRE: *Grafton Co.; Strafford Co.* NEW YORK: *Clinton Co.; Cortland Co.; Erie Co., Essex Co.; Greene Co.; Tioga Co.; Tompkins Co.* NORTH DAKOTA: *Cass Co.* OREGON: *Linn Co.* PENNSYLVANIA: *Allegheny Co.; Carbon Co.; Cumberland Co.; Dauphin Co.; Lehigh Co.; Wyoming Co.* UTAH: *Box Elder Co.; Cache Co.* VERMONT: *Addison Co.; Windsor Co.* WASHINGTON: *King Co.; Island Co.; Pend Oreille Co.; Stevens Co.* WISCONSIN: *Burnett Co.; Clark Co.; Dane Co.; Manitowoc Co.; Milwaukee Co.; Polk Co.; Price Co.* WYOMING: *Teton Co.*

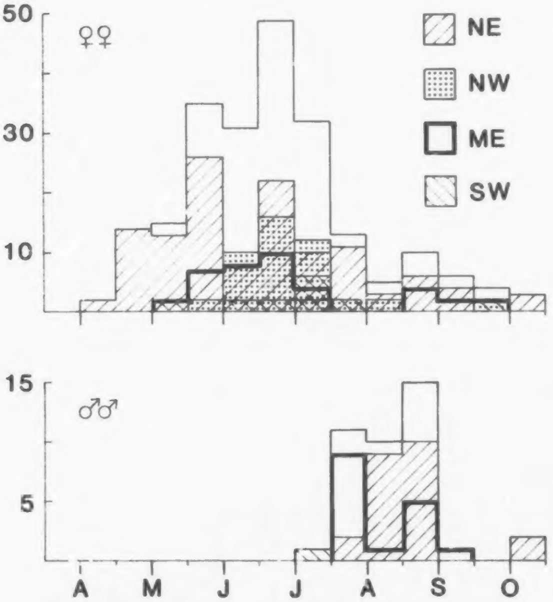


FIGURE 299.—*Lasioglossum athabascense* flight records (outer line = total).

6. *Lasioglossum bajaense*, new species

FIGURES 21, 300–301

TYPE MATERIAL.—The female holotype is labeled

MEX.[ico]. B.[aja] C.[alifornia] Sur:trail, LaBurrera-LaLaguna, Sierra de LaLaguna, 850 m.[eters] 28-VIII [August]-[19]77 coll.[ector] R.R. Snelling/HOLOTYPE Lasioglossum bajaense R.J. McGinley [red label].

The holotype is in excellent condition except for missing the fifth tarsomere of the right hind leg. It is deposited in the Los Angeles County Museum of Natural History, Los Angeles, California.

Two female paratypes, also from La Laguna, Baja California, are in the California State Collection of Arthropods, Sacramento, California, and in the collection of the National Museum of Natural History, Smithsonian Institution.

Distribution (Figure 300).—*Lasioglossum bajaense* is presently known from only three females collected from La Laguna, Baja California, in 1977 and 1979.

Diagnosis.—The smooth, highly polished posterior half of the dorsal propodeal surface will distinguish *L. bajaense* from all other New World *Lasioglossum* except *L. argutum* (smooth propodeal surfaces in other species are dull, not shiny). Along with differences in distribution (Figures 261, 300) these two species can be differentiated by the presence of a large metasomal acarinarium in *L. bajaense* (similar to that of *L. uyacicola*, Figure 728). *Lasioglossum argutum* lacks an acarinarium and is a much smaller bee (length 7.1–8.6, x̄ = 8.0 vs. 8.2–9.2, x̄ = 8.8).

Description.—female: (1) Length 8.2–9.2 mm (x̄ = 8.8, n = 3); (2) wing length 2.5–2.8 mm (x̄ = 2.7, n = 3); (3) abdominal width 2.5–2.8 mm (x̄ = 2.7, n = 3).

Structure: (4) Head moderately short (appearing slightly shorter than that of *L. athabascence*, Figure 288; length/width ratio 0.88–0.92, x̄ = 0.91, n = 3). (7) Supraclypeal area evenly rounded, (8) moderately protuberant. (9) Clypeus projecting approximately 0.71 of its length below lower margin of eyes; (11) median longitudinal sulcation apparently absent, possibly obscured by punctation. (14) Distance between lateral ocelli subequal to distance between lateral ocellus and eye. (23) Flagellomere 1 subequal to 2 in length along dorsal surface. Labrum as in Figure 301; (27) distal keel broad in frontal view, spoon-shaped with conspicuous basal median groove; (28) distal lateral projections extremely well developed, sharply projecting as in *L. asaphes;* (29) fimbrial setae acutely pointed.

(32) Pronotal lateral angle moderately obtuse; (33) pronotal lateral ridge incomplete, interrupted by oblique lateral sulcus; (34) lower portion of lateral ridge narrowly rounded. (35) Mesoscutal lip very weakly bilobed, (36) moderately elevated from pronotum. (40) Dorsal surface of propodeum about 0.82 the length of

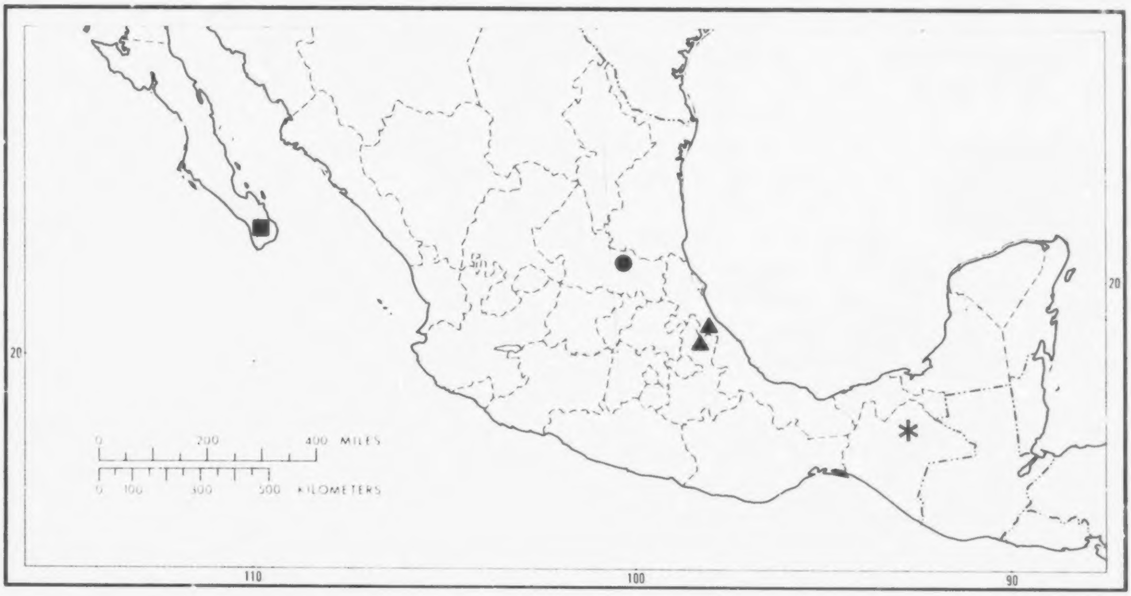


Figure 300.—Distribution of *Lasioglossum bajaense* (square), *L. orphnaeum* (triangle), *L. perscabrum* (circle), and *L. tropidonotum* (asterisk).

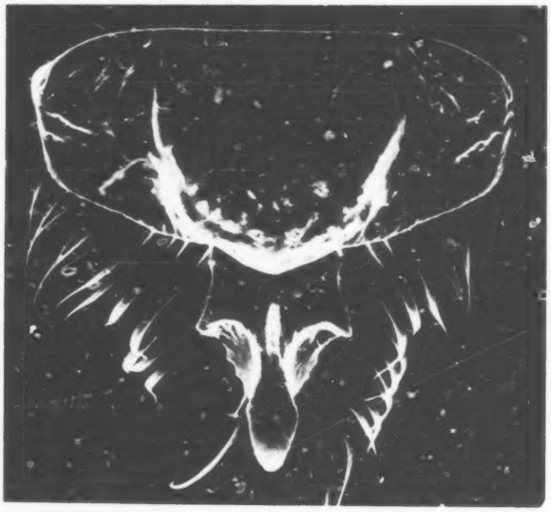


FIGURE 301.—*Lasioglossum bajaense*, female labrum.

scutellum and about 1.5 times the length of metanotum, (41) very slightly depressed centrally, (42) posterior margin rounded; (43) propodeal triangle weakly defined, evident medially as a low V-shaped elevation and lateral impressed lines (elevated lateral rims absent); (44) lateral carinae extending just beyond midpoint of posterior surface. (45) Tibial spur as in Figure 21.

(46) Lateral edge of metasomal tergum II only faintly sinuate, virtually straight.

Sculpture: (47) Face shiny, (48) densely punctate below ocelli, punctures contiguous, becoming larger and less dense near antennae. (51) Supraclypeal area obscurely granulate, very shiny; (52) punctures separated by their width laterally, becoming sparse centrally. (53) Clypeus polished; (54) punctures separated by less than their width basally and medially, apicolateral areas largely impunctate. (56) Mesoscutum moderately shiny; (57) doubly-punctate, smaller punctures separated by 1–2 times their width, larger punctures 2–4 times their width apart. (58) Scutellar punctation weakly developed, obscurely doubly-punctate; smaller punctures extremely fine, inconspicuous, separated by 1–5 times their width, larger punctures widely scattered. (63) Dorsal surface of propodeum rugulose-striolate over basal half, posterior half smooth, somewhat polished; (64) basal half alveolated. (65) Metasomal tergum I moderately shiny; (66) punctation fine, extremely dense, punctures less than their width apart.

Coloration: (71) Wing membrane mostly hyaline, apex lightly infuscated.

Vestiture: (74) Pubescence of head white. (75) Pubescence of thorax white; (76) mesoscutal hairs moderately dense and plumose. (77) Hind tibial hair color weakly differentiated, most hairs white, dorsal hairs brown to light brown. (78) Anterior hairs of metasomal tergum I and (79) basal hair bands of terga II–IV white. (80) Acarinarium present (similar to Figure 728), a large, circular, glabrous area surrounded laterally and dorsolaterally by elongate fringe hairs; dorsal opening of acarinarium wide, wider than width of lateral fringe hairs as seen in dorsal view.

SPECIMENS EXAMINED.—3♀.

MEXICO. BAJA CALIFORNIA SUR: Sierra de La Laguna, Trail, La Burrera–La Laguna, 28 Aug 1977, 850 m, R.R. Snelling (1♀ holotype; LACM); Sierra de La Laguna (17.3 air mi ENE Todos Santos), 17–18 Dec 1979, M.S. Wasbauer (2♀; CDA, NMNH).

7. *Lasioglossum bardum* (Cresson)

FIGURES 22, 302–308

Halictus bardus Cresson, 1872:251 [female].—Dalla Torre, 1896:55 [World catalog].—Cockerell, 1897:163, 165 [locality and flower records, taxonomic notes]; 1898a:46 [key]; 1898c:51 [taxonomic notes]; 1906:294 [locality record]; 1916a:254 [taxonomic notes].—Cresson, 1916:167 [lectotype designation].

Lasioglossum bardum.—Michener, 1951:1106 [Nearctic catalog].—Hurd, 1979:1957 [Nearctic catalog].

Lasioglossum bardus.—Moldenke and Neff, 1974:52 [distribution and floral records; incorrectly reported from Arizona, California, and New Mexico].

TYPE MATERIAL.—Cresson's original description of *Halictus bardus* was based on two female syntypes from the Belfrage collection. Cresson later (1916) designated one of the specimens as the lectotype. This specimen is in the Academy of Natural Sciences at Philadelphia and is labeled Tex.[as]/TYPE No. 2116 [red label]/Halictus bardus 665

Cr[esson][handwritten]/LECTOTYPE Halictus bardus Cresson des.[ignated by] Cresson, 1916 [handwritten, red label, labeled by McGinley, 1983].

The lectotype is an excellent condition except for missing the last two tarsomeres on both hind legs. The paralectotype is in the National Museum of Natural History, Smithsonian Institution.

DISTRIBUTION (Figure 302).—*Lasioglossum bardum* is presently known from 111 female specimens collected from seven counties in central Texas. Hurd (1979) indicated that this species is found from Texas to California; however, the records from New Mexico and Arizona were most likely based on specimens of *L. morrilli*, which are similar to *L. bardum* and were commonly misidentified by earlier workers. In central Texas, *L. bardum* and *L. morrilli* have contiguous distributions but as yet are not known to be sympatric.

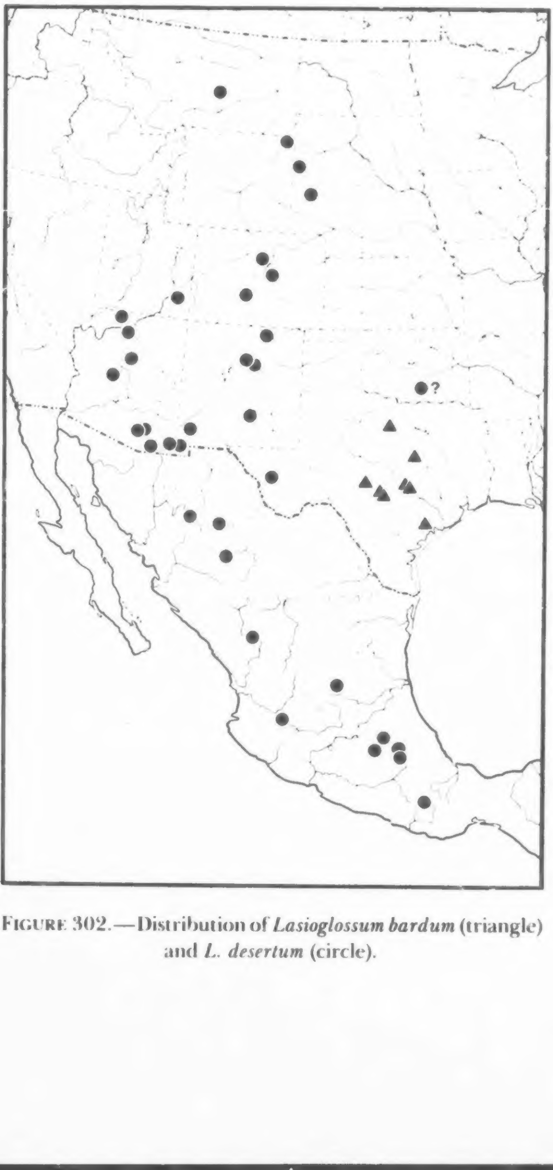
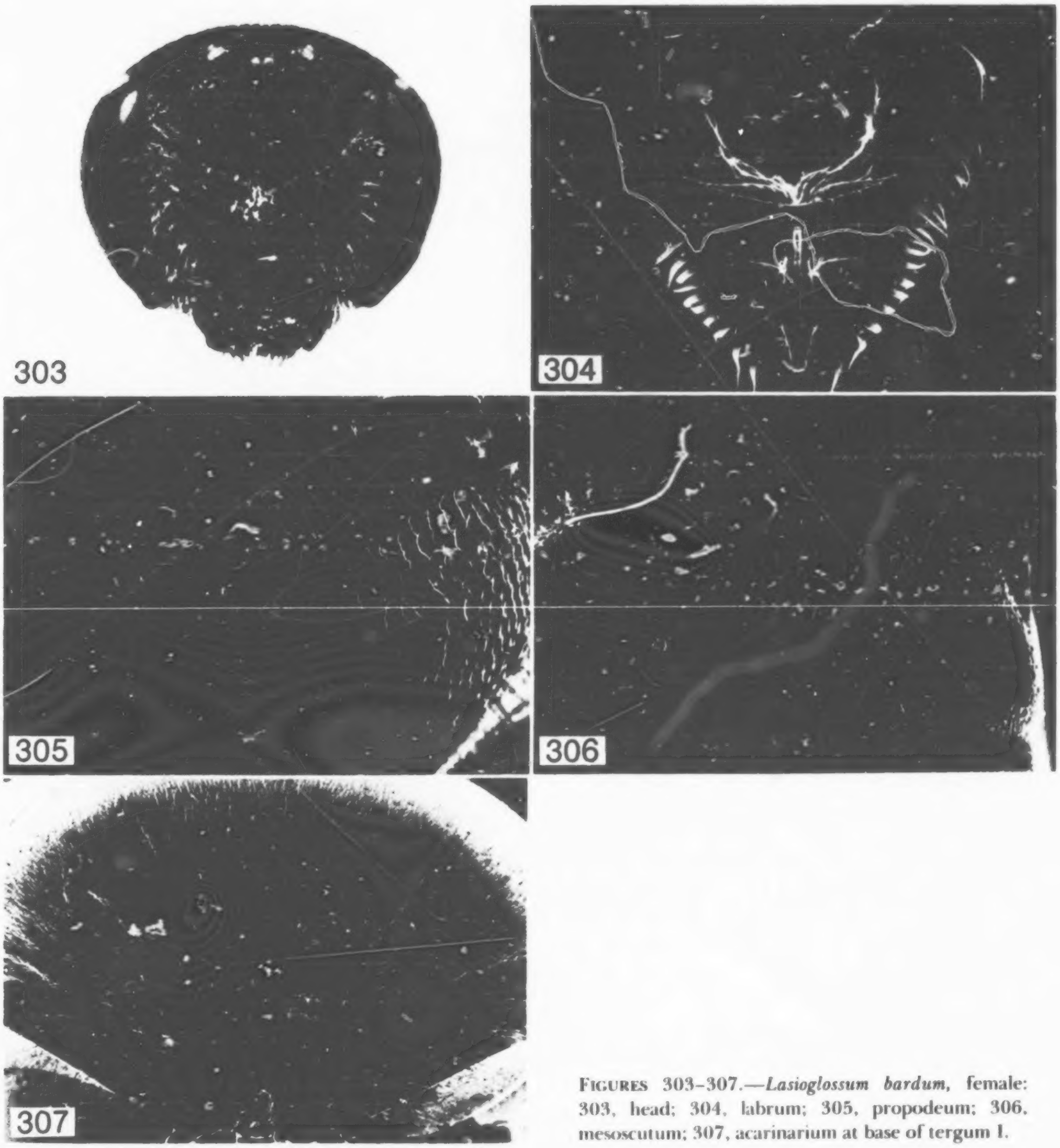


FIGURE 302.—Distribution of *Lasioglossum bardum* (triangle) and *L. desertum* (circle).

DIAGNOSIS.—The combination of a short head (Figure 303, length/width ratio 0.75–0.92) and hyaline wing membranes will distinguish *Lasioglossum bardum* from other *Lasioglossum* species having an acarinarium on the first metasomal tergum I (Figure 307) except for *L. jubatum* and *L. desertum*. *Lasioglossum jubatum*, known from Mexico and southern Arizona, is easily recognized by its deep golden to pale ferrugineous mesoscutal pubescense (white in *L. bardum*). *Lasioglossum desertum* is very similar to *L. bardum* but has a much wider dorsal opening of the acarinarium (opening wider than lateral hair fringe in *L. desertum*, Figure 393; opening narrower than lateral hair fringe in *L. bardum*, Figure 307). *Lasioglossum morrilli*, which also occurs in Texas and is commonly confused with *L. bardum*, is highly distinctive with an elongate head (Figure 520, length/width ratio 0.86–0.96) and a highly polished, very sparsely punctate clypeus and supraclypeal area (granulate and moderately to densely punctate in *L. bardum*). The common and widespread species of the *forbesii* and *trizonatum* groups have not been collected from Texas. Furthermore, the pale yellowish brown wing membranes and relatively elongate heads of the latter species would distinguish them from *L. bardum*.

DESCRIPTION.—FEMALE: (1) Length 8.2–10.1 mm ($\bar{x} = 8.8$, n = 20); (2) wing length 2.3–2.7 mm ($\bar{x} = 2.5$, n = 20); (3) abdominal width 2.6–3.1 mm ($\bar{x} = 2.8$, n = 20).

Structure: (4) Head moderately short (Figure 303; length/width ratio 0.75–0.92, $\bar{x} = 0.87$, n = 20). (7) Supraclypeal area evenly rounded, (8) weakly protuberant. (9) Clypeus projecting approximately 0.73 its length below lower margin of eyes, (11) surface without median longitudinal sulcation. (14) Distance between lateral ocelli



FIGURES 303–307.—*Lasioglossum bardum*, female: 303, head; 304, labrum; 305, propodeum; 306, mesoscutum; 307, acarinarium at base of tergum I.

slightly exceeding distance between lateral ocellus and eye. (23) Flagellomere 1 shorter than 2 along dorsal surface. Labrum as in Figure 304; (27) distal keel broad as seen in frontal view, widest basally with conspicuous basal median groove; (28) distal lateral projections very well developed, strongly concave apically; (29) fimbrial setae acutely pointed.

(32) Pronotal lateral angle broadly obtuse; (33) pronotal lateral ridge incomplete, interrupted by

oblique lateral sulcus; (34) lower portion of lateral ridge sharply edged. (35) Mesoscutal lip weakly bilobed, (36) moderately elevated. (40) Dorsal surface of propodeum about 0.70 the length of scutellum and about 1.2 times the length of metanotum, (41) slightly depressed centrally, (42) posterior margin broadly rounded; (43) propodeal triangle weakly defined, median portion slightly elevated, lateral rims weakly developed; (44) lateral carinae extending at most to midpoint of posterior surface. (45) Tibial spur as in Figure 22.

(46) Lateral edge of metasomal tergum II very weakly sinuate, nearly straight.

Sculpture: (47) Face shiny, (48) densely punctate below ocelli, punctures contiguous, becoming larger and less dense near antennae. (51) Supraclypeal area moderately granulate, (52) punctation nearly uniform, punctures 1–2 times their width apart. (53) Clypeus granulate basally, apical half polished (54) punctures well formed basally, separated by less than their width, becoming larger, somewhat obscure and less dense apically, apicolateral areas punctate. (56) Mesoscutum shiny; (57) punctation as in Figure 306, densely punctate laterally and anteriorly, punctures separated by their width or less, becoming more sparsely punctate centrally, punctures separated by 1–4 times their width. (58) Scutellar punctation nearly uniform, similar to that of central area of mesoscutum. (63) Dorsal surface of propodeum rugulose to ruguloso-striolate, striae obscurely reaching posterior margin (Figure 305); (64) surface alveolated. (65) Metasomal tergum I moderately shiny; (66) punctation fine, dense, punctures slightly less than their width apart.

Coloration: (71) Wing membrane hyaline.

Vestiture: (74) Pubescence of head white. (75) Pubescence of thorax white; (76) mesoscutal hairs moderately dense and plumose. (77) Hind tibial hair color differentiated, most hairs white, dorsal hairs brown basally, becoming light-brown distally. (78) Anterior hairs of metasomal tergum I and (79) basal hair bands of terga II–IV white. (80) Acarinarium present (Figure 307), a large circular, glabrous area at base of tergum I, surrounded laterally and dorsolaterally by elongate fringe hairs, dorsal opening of acarinarium wide, opening subequal to or wider than width of lateral hair fringe as seen in dorsal view.

FLIGHT RECORDS (Figure 308).—Female *L. bardum* have been collected from late March to late September, with most records from May and June, with a peak in early June.

FLOWER RECORDS.—Females (103): Labiatae 47%; Onagraceae 31%. Total: 103 in 8 families, 10 genera as follows:

**Agalinis* 6(6)♀; *Asclepias* 2♀; *Carduus* 1♀; *Hymenopappus* 1♀; *Lupinus* 1♀; **Mimosa* 2(2)♀; **Monarda* 48(29)♀; **Oenothera* 32(29)♀; **Opuntia* 3(1)♀; *Phacelia* 7♀.

ADDITIONAL SPECIMENS EXAMINED.—110♀.

UNITED STATES. TEXAS: *Gillespie Co.:* Harper, 17 Apr 1953, L.D. Beamer (2♀; KU). *Kerr Co.:* Kerrville, 14 Jun 1907, F.C. Pratt (1♀; USNM), 17–19 Jun 1908, F.C. Pratt (4♀; USNM), 2 Apr 1959, W.R.M. Mason (1♀; CNC), 8 mi NW, 2 Jun 1975, C.D. Michener & party (39♀; KU); Kerrville State Park, 2 Jun 1975, C.D. Michener & party (1♀; KU). *Menard Co.:* Menard, 14 mi S, 2 Jun 1975, C.D. Michener & party (3♀; KU). *McLennan Co.:* Waco, 28 Aug 1906, F.C. Bishopp (2♀; USNM) (1♀; MCZ). *Palo Pinto Co.:* Mineral Wells, 6 May 1976, J.R. Powers (1♀; UCB). *Travis Co.:* Austin, 4 May 1900, A.L. Melander (1♀; WSU), 11 May 1969, B. Vogel (2♀; UColB), 28 Sep 1979, J. Neff (6♀; LACM), 2–7 May 1980, P.D. Hurd, Jr. (8♀; CU, USNM), 15 mi W, 25 Mar 1970, C.D. & M.H. Michener (1♀; KU), 22 mi NW, 31 May 1975, Michener & party (5♀; KU); Mansfield, 4 mi NE, 31 May 1975, Michener & party (20♀; KU). *Victoria Co.:* Victoria, 24 Apr 1907, F.C. Bishopp (1♀; USNM). *Williamson Co.:* Florence, 4 mi N, 30 May 1975, Michener & party (11♀; KU).

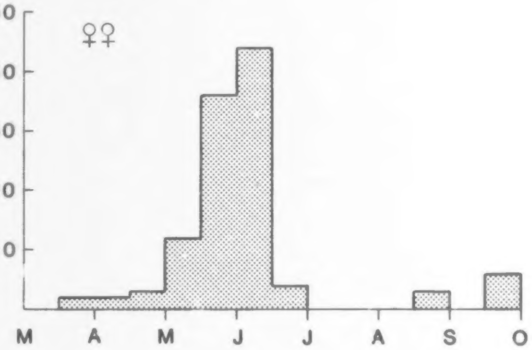


FIGURE 308.—*Lasioglossum bardum* flight records.

8. *Lasioglossum cercothrix*, new species

FIGURES 23, 309–318

TYPE MATERIAL.—The female holotype of *L. cercothrix*, in the University of California, Davis, is labeled

Mex[ico] 4 mi SE Temoris Chih[uahua] VIII [Aug] 29 1969/ T A Sears R O Gardner C S Glaser/HOLOTYPE Lasioglossum cercothrix R.J. McGinley [red label].

The holotype is in excellent condition. Eight paratypes, including the one known male, are in the University of California, Davis; six at Utah State University, Logan; three at the University of Kansas, Lawrence; and one at Oregon State University, Corvallis.

ETYMOLOGY.—The specific epithet is derived from the Greek *kerkos* (tail) plus *thrix* (hair), a reference to the terminal terga of this species being entirely covered by dense, adpressed pubescence.

DISTRIBUTION (Figure 309).—*Lasioglossum cercothrix* is presently known from only 19 females and one male. It appears to be a widespread species in Mexico, with current records ranging from Chihuahua south to the state of Puebla.

DIAGNOSIS.—The coarse, contiguous mesoscutal punctation (Figure 313) and the presence of short, adpressed hairs entirely covering terga IV–V (females; similar to Figure 1) and terga IV–VI (males) will distinguish *L. cercothrix* from all other known New World *Lasioglossum*. *Lasioglossum sandrae*, *L. crocoturum*, and *L. tropidonotum* are the only other *Lasioglossum* species having the terminal terga entirely covered by short, adpressed hairs. The latter two species differ from *L. cercothrix* in having much finer mesoscutal punctuation that is granuloso-punctate throughout (Figure 1) and in having longer heads (Figure 723; *L. cercothrix* head short, Figure 310). *Lasioglossum sandrae* is a very different bee, having the mesoscutum entirely covered by short, adpressed pale hairs. Also helpful in recog-

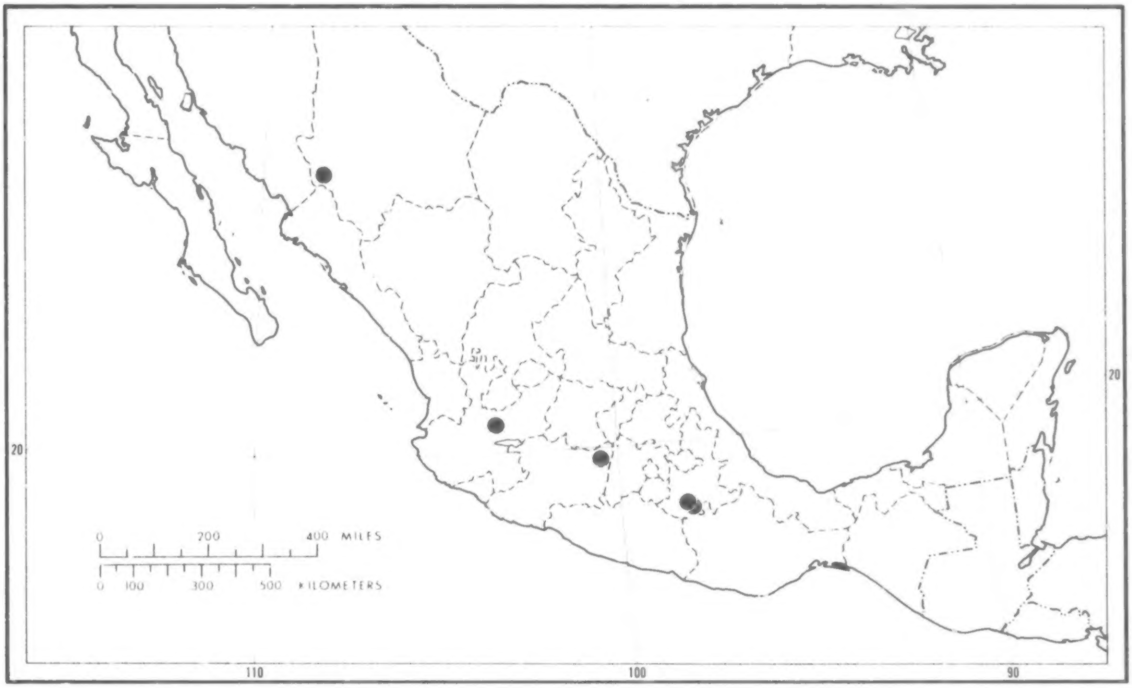
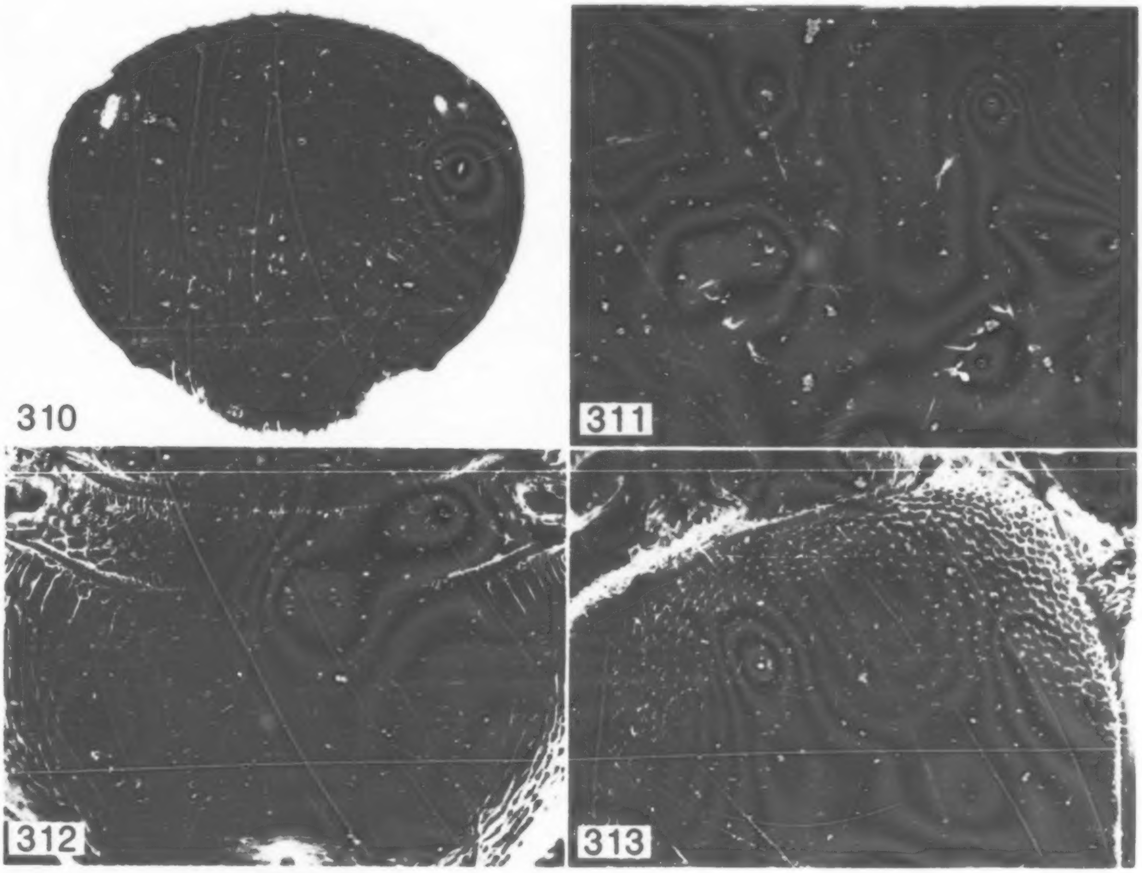


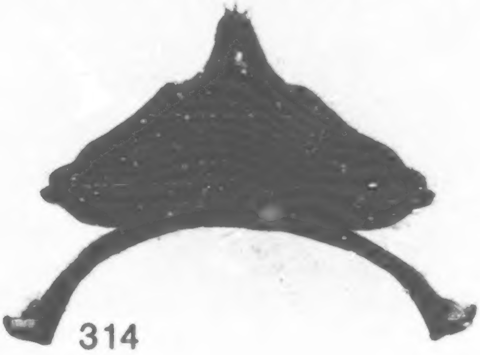
FIGURE 309.—Distribution of *Lasioglossum cercothrix*.

nizing *L. cercothrix* is the rounded, relatively smooth and shiny posterior edge of the propodeal dorsal surface (Figure 312).

DESCRIPTION.—FEMALE: (1) Length 8.3–9.8 mm ($\bar{x} = 8.9$, $n = 15$); (2) wing length 2.4–3.0 mm ($\bar{x} = 2.8$, $n = 15$); (3) abdominal width 2.7–3.0 ($\bar{x} = 2.9$, $n = 15$).

Structure: (4) Head short (Figure 310;





FIGURES 310–314.—*Lasioglossum cercothrix:* 310, female head; 311, female labrum; 312, female propodeum; 313, female mesoscutum; 314, male sterna VII–VIII.

length/width ratio 0.85–0.92, x̄ = 0.88, n = 15). (7) Supraclypeal area evenly rounded, (8) moderately protuberant. (9) Clypeus projecting approximately 0.69 of its length below lower margin of eyes; (11) surface with median longitudinal sulcation. (14) Distance between lateral ocelli subequal to distance between lateral ocellus and eye. (23) Flagellomere 1 subequal to 2 in length along dorsal surface. Labrum as in Figure 311; (27) distal keel moderately broad, lateral edges bowed, with conspicuous basal groove; (28) distal lateral projections moderately well developed, triangular; (29) fimbrial setae acutely pointed.

(32) Pronotal lateral angle narrowly obtuse; (33) pronotal lateral ridge incomplete, interrupted by oblique lateral sulcus; (34) lower portion of lateral ridge weakly edged near oblique sulcus, becoming broadly rounded ventrally. (35) Mesoscutal lip very weakly bilobed, (36) moderately elevated from pronotum. (40) Dorsal surface of propodeum about 0.78 the length of scutellum and about 1.4 times the length of metanotum, (41) slightly depressed centrally, (42) posterior margin broadly rounded; (43) propodeal triangle very weakly defined, evident medially as an extremely inconspicuous V-shaped elevation (margin of dorsal surface unusually rounded with no indications of lateral rims); (44) lateral carinae extending approximately two-thirds the length of posterior surface. (45) Tibial spur as in Figure 23.

(46) Lateral edge of metasomal tergum II straight, broadly rounded posteriorly.

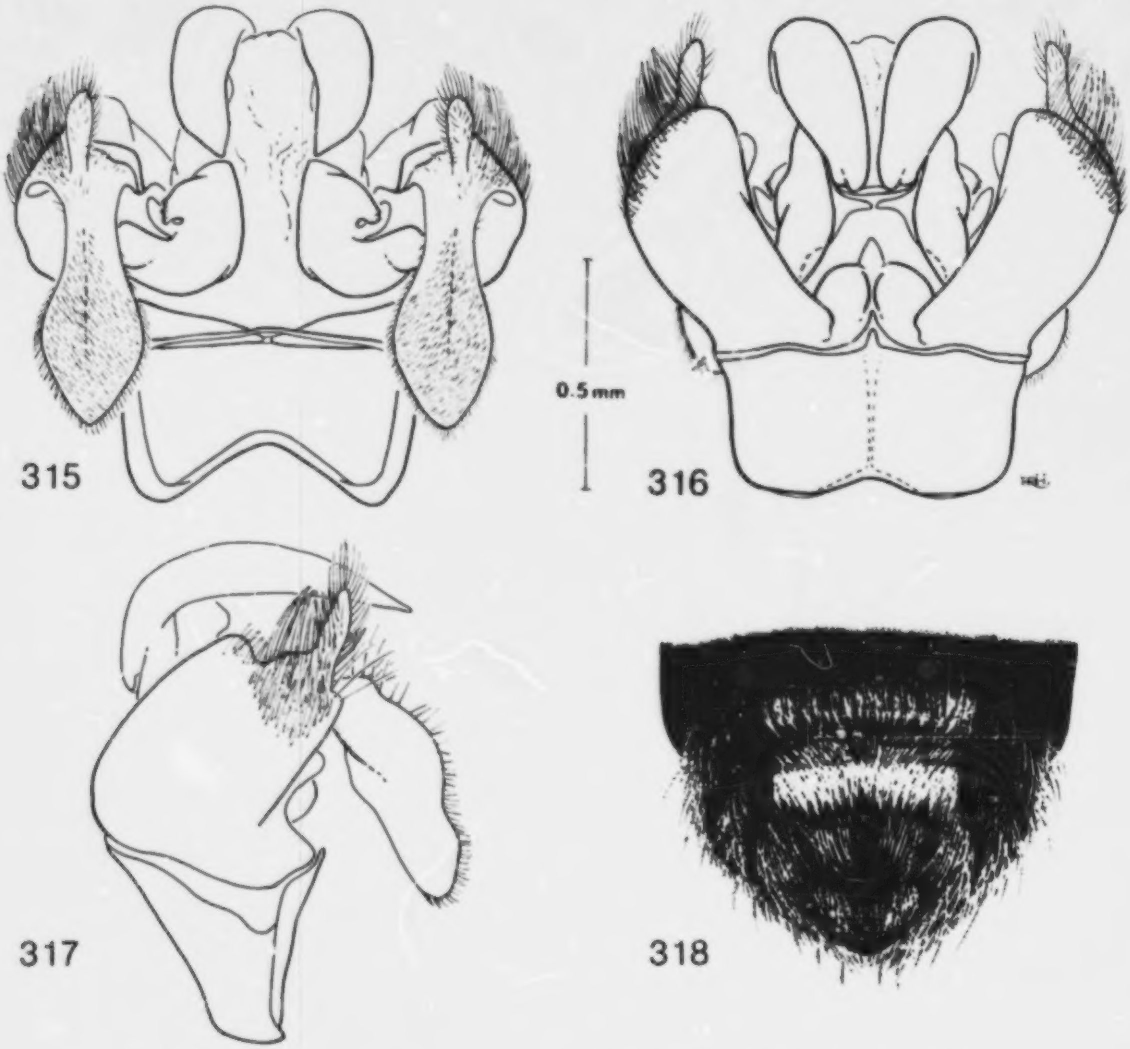
Sculpture: (47) Face moderately shiny, (48) densely punctate below ocelli, punctures contiguous, becoming only slightly larger and less dense near antennae. (51) Supraclypeal area strigulate; (52) punctures separated by their width or less laterally, becoming sparse centrally. (53) Clypeus obscurely granulate basally, apical two-thirds polished; (54) punctures separated by less than their width, apicolateral areas very sparsely punctate. (56) Mesoscutum moderately dull; (57) punctation as in Figure 313, punctures coarse, dense and nearly contiguous throughout, interspaces granulate. (58) Scutellum nearly uniformly punctate, punctures at most separated by their width. (63) Dorsal surface of propodeum (Figure 312) striolate laterally, becoming finely ruguloso-striolate medially, posterior edge rounded, somewhat smooth with scattered obscure rugulae; (64) surface not noticeably alveolated. (65) Metasomal tergum I moderately shiny; (66) punctation fine, extremely dense posteriorly, nearly granuloso-punctate, less dense anteriorly, punctures separated by their width or slightly less.

Coloration: (71) Wing membrane mostly hyaline, lightly infuscated at apex.

Vestiture: (74) Pubescence of head white on gena and near antennae, becoming golden near ocelli and on vertex. (75) Pubescence of thorax mostly white, hairs on mesoscutum and scutellum yellowish brown; (76) mesoscutal hairs moderately dense, simple. (77) Hind tibial hair color differentiated, most hairs white, dorsal hairs light to dark brown. (78) Anterior hairs of metasomal tergum I white, (79) basal hair bands of terga II–IV yellowish white. (80) Acarinarium absent, elongate hairs scattered over anterior surface of tergum I. (81) Unlike most other species, basal hair band on tergum II absent, hair band on tergum IV covers entire tergal surface.

MALE: Similar to female except as follows: (1) length 8.2 mm (n = 1); (2) wing length 2.4 mm; (3) abdominal width 2.2 mm. (4) Head short (length/width ratio 0.88). (5) Gena narrower than eye, (6) moderately produced posteriorly. (10) Clypeal surface flat. (24) Labral distal process absent; (25) basal area depressed medially; (26) basal lateral depressions small but distinct. (30) Mandible short, just reaching opposing clypeal angle. (53) Clypeus weakly granulate throughout, shiny; (54) punctures well formed, nearly contiguous basally, less dense over apical two-thirds. (68) Clypeal maculation present. (69) Flagellum entirely dark. (72) Tarsi dark, concolorous with tibiae.

Vestiture: Sternal vestiture as in Figure 318; (82) hairs on sternum IV moderately elongate, suberect, posterior sternal edge with noticeable fringe of pale hairs; (83) posterior edge of sternum V with conspicuous hair fringe, only indis-



FIGURES 315–318.—*Lasioglossum cercothrix*, male: 315, genitalia, ventral view; 316, same, dorsal view; 317, same, lateral view; 318, sternal vestiture.

tinctly divided medially into lateral lobes.

Terminalia: Sterna VII–VIII as in Figure 314; (85) sternum VIII with moderately short, narrowly rounded median process. Genitalia as in Figures 315–317; (86) gonobase moderately elongate; (87) gonostylus elongate, slender (unlike other species, gonocoxite hairy distally near base of gonostylus; (89) retrorse membranous lobe broad near midpoint, tapering apically; (90) volsella with prominent lateral lobe.

FLIGHT RECORDS.—Female records range from late June to late September. The one known male was collected in late August.

FLOWER RECORDS.—Two pollen-laden females taken from *Xanthoxylum* (Rutaceae) in the state of Puebla (8 mi SE Tehuitzingo).

Specimens Examined.—20 (19♀, 1♂).

MEXICO. Chihuahua: Sante Nino, 31 Aug 1968, T.A. Sears, R.C. Gardner, C.S. Glaser (2♀; UCD), 1 Sep 1968, T.A. Sears, R.C. Gardner, C.S. Glaser (3♀; UCD); Temoris, 3 Sep 1969, T.A. Sears, R.C. Gardner, C.S. Glaser (1♀; UCD), 2 mi N, 22 Aug 1968, T.A. Sears, R.C. Gardner, C.S. Glaser (1♀; UCD), 3 mi SE, 8 Sep 1969, Sears, Gardner, Glaser (1♀; UCD), 4 mi SE, 29 Aug 1969, Sears, Gardner, Glaser (1♀ holotype, 1♂; UCD). Jalisco: Guadalajara, 15 mi NE, 17 Sep 1970, G.E. & R.M. Bohart (6♀; USU). Michoacan: Tuxpan to San Jose Purva, 22 Jun 1963, 5200 ft, Scullen & Bolinger (1♀; OrS). Puebla: Petlalcingo, 4 mi NW, 4 Jul 1953, Univ. Kansas Mex. Exped. (1♀; KU); Tehuitzingo, 8 mi SE, 29 Jun 1961, 4100 ft, Univ. Kansas Mex. Exped. (2♀; KU).

9. *Lasioglossum channelense*, new species

Figures 24, 100, 319–331

Type Material.—The female holotype of *L. channelense* is the property of the California Insect Survey, University of California at Berkeley, but is on loan deposit to the California Academy of Sciences in San Francisco. The specimen is in excellent condition and is labeled

Calif[ornia]: Sta. [Santa] Cruz Id. [Island], Ridge S.[outh] of Chinese Harbor VI [June]-9-1966/R.L. Langston collector/ HOLOTYPE Lasioglossum channelense R.J. McGinley [red label].

Two hundred ninety-four paratypes listed in the "Specimens Examined" section are designated.

Distribution.—I have seen specimens of *L. channelense* only from Santa Cruz Island, Santa Barbara County, off the coast of southern California. Rust et al. (1985) report *L. trizonatum* from Santa Rosa Island. Because *L. channelense* has long been considered to be a form of *L. trizonatum*, the Santa Rosa Island specimens are most likely those of *L. channelense*.

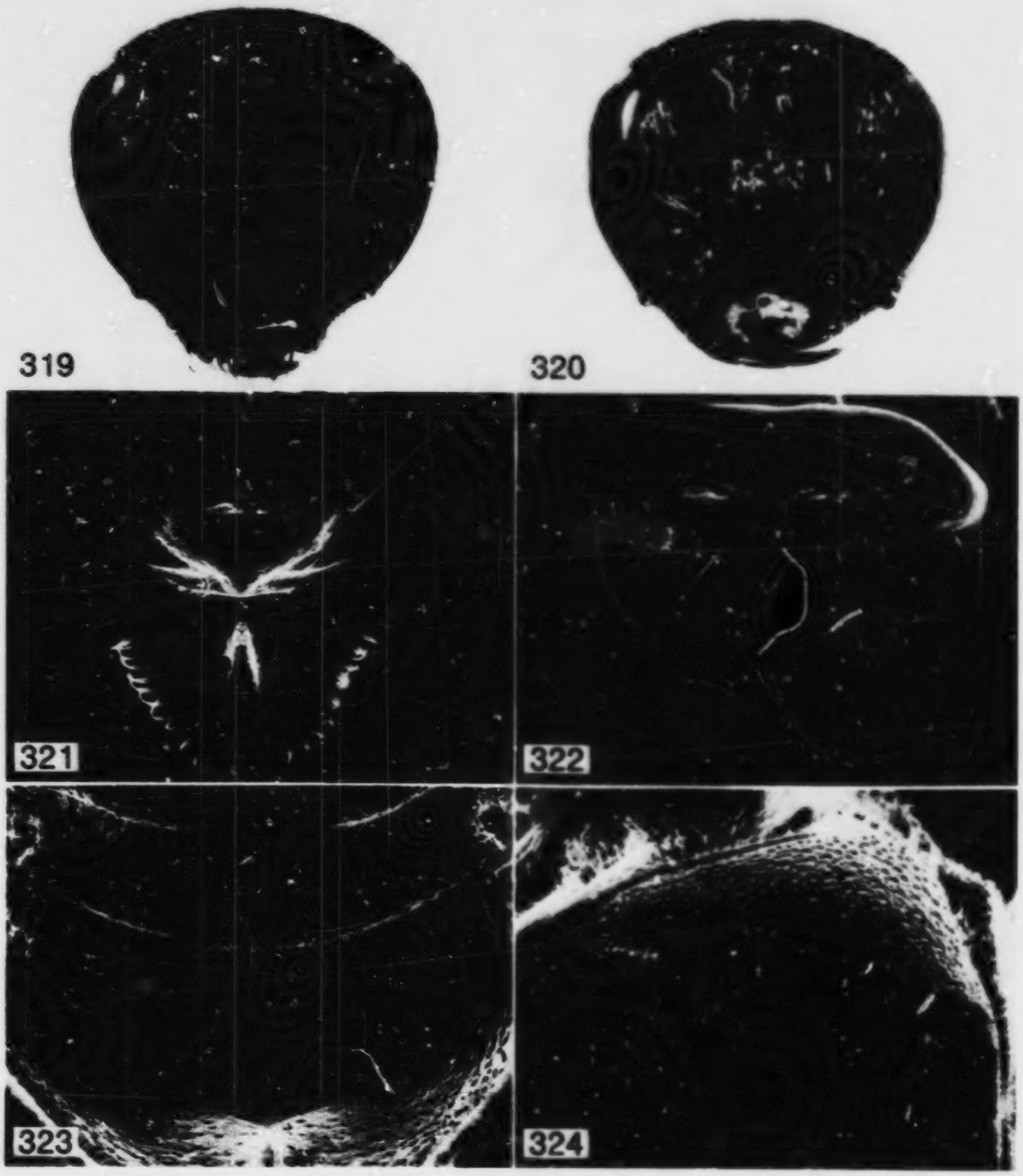
Diagnosis.—Females of *L. channelense* can be recognized by the following character combination: mid and hind tarsi and hind tibiae yellowish orange; acarinarium on anterior surface of tergum I present (Figure 330); pronotal lateral carina virtually complete, at most only inconspicuously interrupted by lateral sulcus (Figure 100); anterior quarter of mesoscutum granuloso-punctate (Figure 324). These females are superficially most similar to those of the mainland *L. mellipes*. They differ most conspicuously in having the nearly complete pronotal lateral carina (obviously interrupted in *L. mellipes* and other *trizonatum* forms, Figure 10) and by having the anterior mesoscutal edge granuloso-punctate (punctures dense but not granuloso-punctate in *trizonatum* forms, Figure 675). Furthermore, the wing membranes of *L. channelense* are entirely hyaline (slightly yellowish brown in *L. mellipes*).

Males of *L. channelense* are also similar to those of *L. mellipes* in having yellowish orange tarsi and erect lateral hair tufts on sternum V (Figure 325) but differ in having a nearly complete pronotal lateral carina, elongate mandibles, which obviously reach beyond the opposing clypeal angles (Figure 320), and shorter heads (Figure 320, length/width ratio $\bar{x} = 0.93$, versus Figure 698, $\bar{x} = 0.97$).

Description.—female: (1) Length 8.6–10.2 mm ($\bar{x} = 9.7$, $n = 15$); (2) wing length 2.6–3.0 mm ($\bar{x} = 2.8$, $n = 15$); (3) abdominal width 2.9–3.2 mm ($\bar{x} = 3.0$, $n = 15$).

Structure: (4) Head moderately elongate (Figure 319; length/width ratio 0.86–1.0, $\bar{x} = 0.93$, $n = 15$). (7) Supraclypeal area evenly rounded, (8) moderately protuberant. (9) Clypeus projecting approximately 0.95 of its length below lower margin of eyes; (11) surface with obscure median longitudinal sulcation present in most specimens. (14) Distance between lateral ocelli subequal to distance between lateral ocellus and eye. (23) Flagellomere 1 subequal to 2 in length along dorsal surface. Labrum as in Figure 321; (27) distal keel broad in frontal view, widest medially; (28) distal lateral projections well developed, rounded; (29) fimbrial setae acutely pointed.

(32) Pronotal lateral angle broadly obtuse; (33) pronotal lateral ridge superficially appearing complete, interrupted by narrow oblique lateral sulcus; (34) lower portion of lateral ridge elongate and very sharply edged. (35) Mesoscutal lip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Figures 319–324.—*Lasioglossum channelense:* 319, female head; 320, male head; 321, female labrum; 322, male labrum; 323, female propodeum; 324, female mesoscutum.

very weakly bilobed, (36) moderately elevated from pronotum. (40) Dorsal surface of propodeum about 0.78 the length of scutellum and about 1.4 times the length of metanotum, (41) slightly depressed centrally, (42) posterior margin broadly rounded; (43) propodeal triangle very weakly defined laterally, evident medially as a very inconspicuous V-shaped elevation with lateral rims; (44) lateral carinae extending at most to midpoint of posterior surface. (45) Tibial spur as in Figure 24.

(46) Lateral edge of metasomal tergum II sinuate.

Sculpture: (47) Face shiny, (48) granuloso-punctate below ocelli, punctation only slightly less dense near antennae. (51) Supraclypeal area polished; (52) punctures separated by their width laterally, becoming impunctate centrally. (53) Clypeus strongly granulate basally, apical half moderately polished; (54) punctures separated by not more than their width basally, becoming obscurely formed and less dense apically. (56) Mesoscutum shiny; (57) punctation as in Figure 324, punctures dense laterally, contiguous, becoming granuloso-punctate anteriorly, much less dense centrally, punctures 2–3 times their width apart. (58) Scutellum conspicuously doubly-punctate, smaller punctures separated by their width or slightly less, larger punctures separated by 2–4 times their width. (63) Dorsal surface of propodeum (Figure 323) ruguloso-granulate; (64) surface obscurely alveolated. (65) Metasomal tergum I moderately shiny; (66) punctation fine, dense, punctures slightly less than their width apart.

Coloration: (71) Wing membrane hyaline. (72) Unlike most species, mid and hind tarsi, hind tibiae and distal quarter of mid tibiae pale yellowish orange.

Vestiture: (74) Pubescence of head white. (75) Pubescence of thorax white on pronotum and mesopleuron, hairs on mesoscutum and scutellum mostly brown, metanotum with mixture of white and brown hairs; (76) mesoscutal hairs moderately dense and plumose. (77) Hind tibial hair color differentiated, most hairs yellowish brown, dorsal hairs brown to light brown. (78) Anterior hairs of metasomal tergum I and (79) basal hair bands of terga II–IV white. (80) Acarinarium present (Figure 330), a moderately large glabrous area at base of tergum I, surrounded laterally by moderately sparse, elongate fringe hairs that lack a sharply delimited border; acarinarial surface often with some scattered hairs; dorsal opening of acarinarium moderately wide, not sharply delimited, width slightly less than width of lateral hair fringe as seen in dorsal view.

MALE: Similar to female except as follows: (1) length 7.8–10.0 mm ($\bar{x} = 8.7$, $n = 15$); (2) wing length 2.3–2.7 mm ($\bar{x} = 2.5$, $n = 15$); (3) abdominal width 2.0–2.3 mm ($\bar{x} = 2.2$, $n = 15$). (4) Head as in Figure 320 (length/width ratio 0.88–0.96, $\bar{x} = 0.94$, $n = 15$). (5) Gena conspicuously wider than eye, (6) strongly produced posteriorly. (10) Clypeal surface shallowly depressed ventrally. Labrum as in Figure 322; (24) distal process weakly to moderately developed, narrowly rounded to somewhat pointed; (25) basal area depressed medially; (26) basal lateral depressions absent. (30) Mandible elongate, reaching midway between opposing clypeal angle and mandibular base. (53) Clypeus polished; (54) punctures well formed and dense along basal

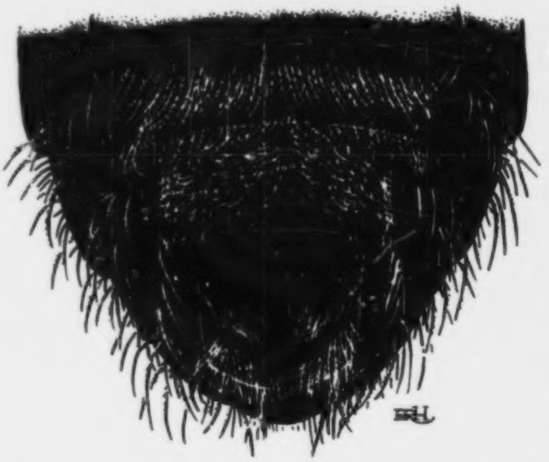
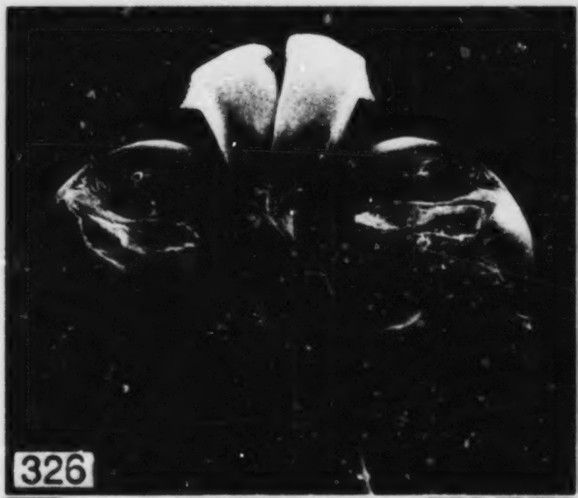


FIGURE 325.—*Lasioglossum channelense*, male sternal vestiture.



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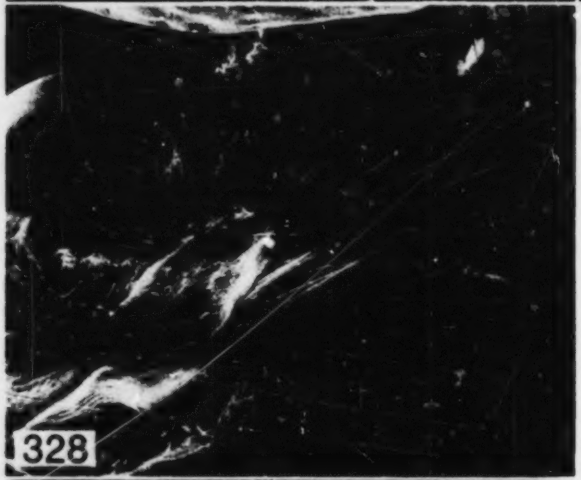

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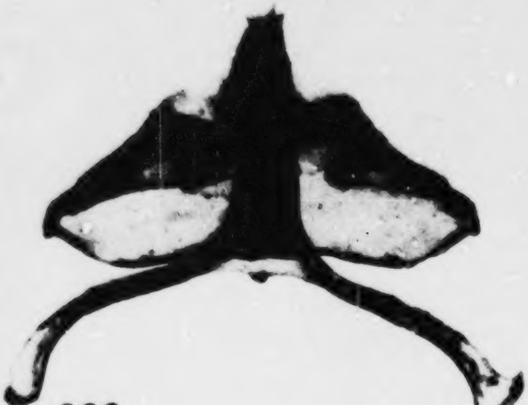

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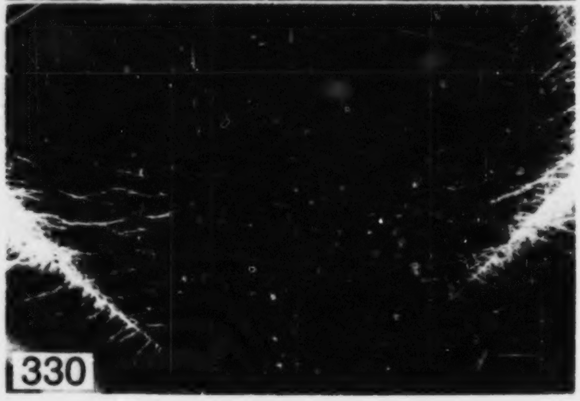

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Figures 326–330.—*Lasioglossum channelense:* 326, male genitalia, ventral view; 327, same, dorsal view; 328, male gonostylus; 329, male sterna VII–VIII; 330, female acarinarium at base of tergum I.

edge, apical three-quarters virtually impunctate, puncture extremely fine and scattered. (68) Clypeal maculation present (Figure 320). (69) Flagellum only slightly paler ventrally than on dorsum. (72) Tarsi yellowish orange, contrasting with dark tibiae.

Vestiture: Sternal vestiture as in Figure 325; (82) hairs on sternum IV elongate, erect; (83) hairs on sternum V erect, moderately elongate (slightly longer laterally), apices directed laterad from midline.

Terminalia: Sterna VII–VIII as in Figure 329; (85) sternum VIII with short, narrowly rounded median process. Genitalia as in Figures 326–328.

FLIGHT RECORDS (Figure 331).—Females of *L. channelense* have been collected from March through June, with three females from Canada del Medio taken in late September. Most males have been taken in late April through June, with a peak in early May (two males were collected in August and one in September).

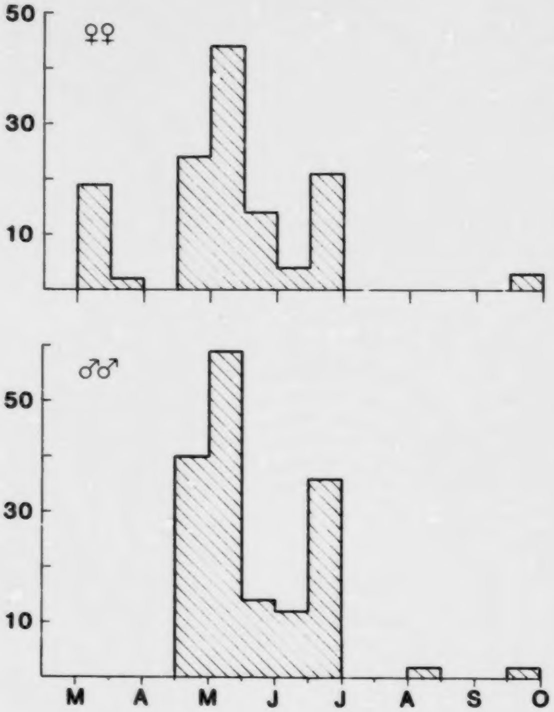


FIGURE 331.—*Lasioglossum channelense* flight records.

FLOWER RECORDS.—Females (15): Cruciferae 40%; Ranunculaceae 33%. Males (5): Rosaceae 80%. Total: 20 in 6 families, 6 genera as follows:

Arctostaphylos 1♂; **Brassica* 6(6)♀; **Cirsium* 1(1)♀; *Dendromecon* 3♀; *Heteromeles* 4♂; *Ranunculus* 5♀.

SPECIMENS EXAMINED.—295 (134♀, 161♂).

UNITED STATES. CALIFORNIA: *Santa Barbara Co.:* Albert's Ridge, 27 Apr 1966, J. Powell, J. Wolf, J. Slater, R.L. Langston (3♀, 2♂; UCB); Anchorage, 27 Apr 1966, J.Powell, P. Rude, R.L. Langston (1♀, 28♂; UCB); Cal Beach at Water Canyon, 2 May 1969, D.S. Horning, Jr. (1♀; UCD); Campo Raton, 21 Jun 1967, D.S. Horning, Jr. (1♀, 5♂; UCD); Canada Cervada, 26 Apr 1966, J. Powell (1♀, 1♂; UCB); Canada Christi, 21 Jun 1967, A.S. Menke (1♂; UCD); Canada de la Cuesta, 15 Mar 1969, J. Powell, H.V. Daly (4♀; UCB); Canada del Medio, 29 Apr 1969, J.E. Slansky (1♀; UCD), 3 May 1969, D.S. Horning, Jr. (1♂; UCD), 3–12 May 1968, R.L. Brumley, D.R. Miller, R.W. Rust, D.S. Horning, Jr., R.O. Schuster (13♀, 23♂; UCD), 16–23 Jun 1967, D.R. Miller, A.S. Menke, D.S. Horning, Jr., R.O. Schuster (11♀, 22♂; UCD), 20–22 Sep 1968, R.O. Schuster (3♀; UCD); Canada del Puerto, 16 Mar 1969, J. Powell (1♀; UCB), 9 May 1968, R.O. Schuster (1♀; UCD), 16 May 1969, D.S. Horning, Jr. (1♀; UCD), 20 Jun 1967, R.O. Schuster (1♂; UCD); Canyon del Medio, 6 May 1968, D.S. Horning, Jr. (1♂; UCD), 7 May 1968, D.S. Horning, Jr. (1♀; UCD), 15 May 1969, D.S. Horning, Jr. (1♀; UCD), 20 Jun 1967, R.O. Schuster (1♂; UCD); Cascada, 4–8 May 1968, R.L. Brumley, D.S. Horning, Jr., D.R. Miller, R.W. Rust (4♀, 16♂; UCD), 20 May 1967, R.L. Brumley (1♂; UCD).

Central Valley, 25–27 Apr 1966, J. Slater, P. Rude (14♀, 4♂; UCB), 1 May 1966, R.L. Langston (4♀; UCB), 7–8 Jun 1966, J. Powell (3♂; UCB); Central Valley, upper, 15 Mar 1969, P.A. Opler, W.W. Middlekauff (3♀; UCB), 26 Apr 1966, J. Powell, P. Rude, R.L. Langston (3♀; UCB); Chinese Harbor, ridge south of, 9 Jun 1966, R.L. Langston (1♀; 2♂; UCB); Christi Beach, 15 Mar 1969, J.T. Doyen (9♀; UCB), 27 Apr 1969, D.R. Miller (1♀; UCD), 5 May 1968, D.S. Horning, Jr. (3♀; UCD); Coches Prietos, 4 May 1969, D.S. Horning, Jr. (1♀, 2♂; UCD), 9–10 May 1968, D.S. Horning, Jr., R.O. Schuster (7♀, 13♂; UCB), 17 Jun 1967, D.S. Horning, Jr. (1♀, 2♂; UCB); Griffith Canyon, 22 Jun 1967, D.R. Miller (2♂; UCD); Laguna Canyon, ridge north of, 28 Apr 1966, J. Slater, P. Rude, R.L. Langston (3♀, 2♂; UCB), 8 Jun 1966, R.L. Langston (4♂; UCB); Mt. Pleasant, 17 Jun 1967, R.O. Schuster, D.S. Horning, Jr. (2♂; UCD); Portezuela, 22 Jun 1967, D.R. Miller (1♀; UCD); Prisoner's Harbor, 14 Mar 1969, J. Powell (2♀; UCB), 1 May 1966, J. Powell, J. Slater (1♀, 3♂; UCB), 7 May 1968, R.L. Brumley, R.W. Rust (3♀, 1♂; UCD), 7–10 Jun 1966, J. Powell, R.L.

Langston (3♀, 3♂; UCB); South Ridge, 9 May 1968, D.S. Horning, Jr. (4♀; UCD), 20 Jun 1967, D.R. Miller (1♀; UCD), 28 Sep 1968, R.O. Schuster (1♂; UCD); University of California Field Station, 15 Mar 1969, H.V. Daly (1♀; UCB), 1–2 Aug 1969, D.R. Rentz, D. Weissman (2♂; CAS); Water Canyon, 17 Jun 1967, R.L. Brumley, D.S. Horning, Jr. (6♀; UCD); no specific locality, 16–18 May 1919, E.P. VanDuzee (13♀, 13♂; CAS).

10. *Lasioglossum circinatum* (Vachal)

FIGURES 25, 258, 332–335

Halictus circinatus Vachal, 1904:474 [female, male].—Cockerell, 1905a:90 [key].

Halictus supercretus Cockerell, 1910a:260 [female; includes comparisons to five other species]; 1910b:284 [probable type-locality Oaxaca, Mexico]; 1918a:179 [comparative taxonomic notes]. [New synonymy.]

Lasioglossum circinatum.—Moure and Hurd, 1986:59 [catalog].

TYPE MATERIAL.—In referring to his original series of *Halictus circinatus*, Vachal listed "numerous females from Orizaba (Biart 62) and from Mexico (Sichel collection)" (museum notes kindly provided by George C. Eickwort indicate that the female series in the Paris Museum (MNHNP) is comprised of one female labeled "TYPE" and 14 additional females). Vachal also listed two males that he questionably associated with the females. Moure and Hurd (1986) state that "one of the females of the original type series labeled: Orizaba, Biart, was labeled by one of us (Moure) in April, 1958 as the lectoholotype and is now so designated." Only two females from the type series were available for study and the one labeled "TYPE" from the Sichel collection (noted by Eickwort) lacks formal type status. The other specimen from Orizaba (agreeing with Moure's indication) is herein relabeled the lectotype with the designation attributed to Moure to avoid further confusion. The lectotype is missing the distal tarsomere of the right hind leg and has been repinned as evidenced by the pin holes in the thoracic pleura but is otherwise in good condition: it is labeled

MUSEUM PARIS MEXIQUE ORIZABA BIART 1862/14 [?] [18]62 [handwritten on circular label with green undersurface]/circinatus ♀ Sichel [handwritten by Vachal?]/LECTOTYPE Halictus circinatus Vachal des.[ignated by] Moure.

I have attached a paralectotype label to the other female that is still labeled "TYPE."

The two males in Vachal's original series appear to be identical to males known to be associated with *L. acarophilum* in Arizona, where *L. circinatum* does not occur (Figures 245, 258). As Vachal indicated, the association of these males with *L. circinatum* remains doubtful. At present, the males of *L. circinatum* cannot reliably be associated with known females.

The female holotype of *Halictus supercretus* is in the Museum für Naturkunde, Humboldt Universität in Berlin. It is labeled

2583/Mexico [probably Oaxaca, Mexico] [Ferdinand] Deppe [collector]/Type [orange label]/Halictus supercretus Ckll.[Cockerell] TYPE [handwritten by Cockerell]/Zool.[ogy] Mus[eum] Berlin [yellow label].

Half of the eighth and ninth flagellomeres of the left antenna have been eaten away but the specimen is otherwise in good condition. In his original description of *H. supercretus*, Cockerell (1910a) stated: "Among Vachal's mexican species it [*supercretus*] comes to the group of *H. crocoturus* &c., but it does not agree with any of his descriptions." This comment clearly indicates that Cockerell did not have any of Vachal's material at hand when he described *H. supercretus*.

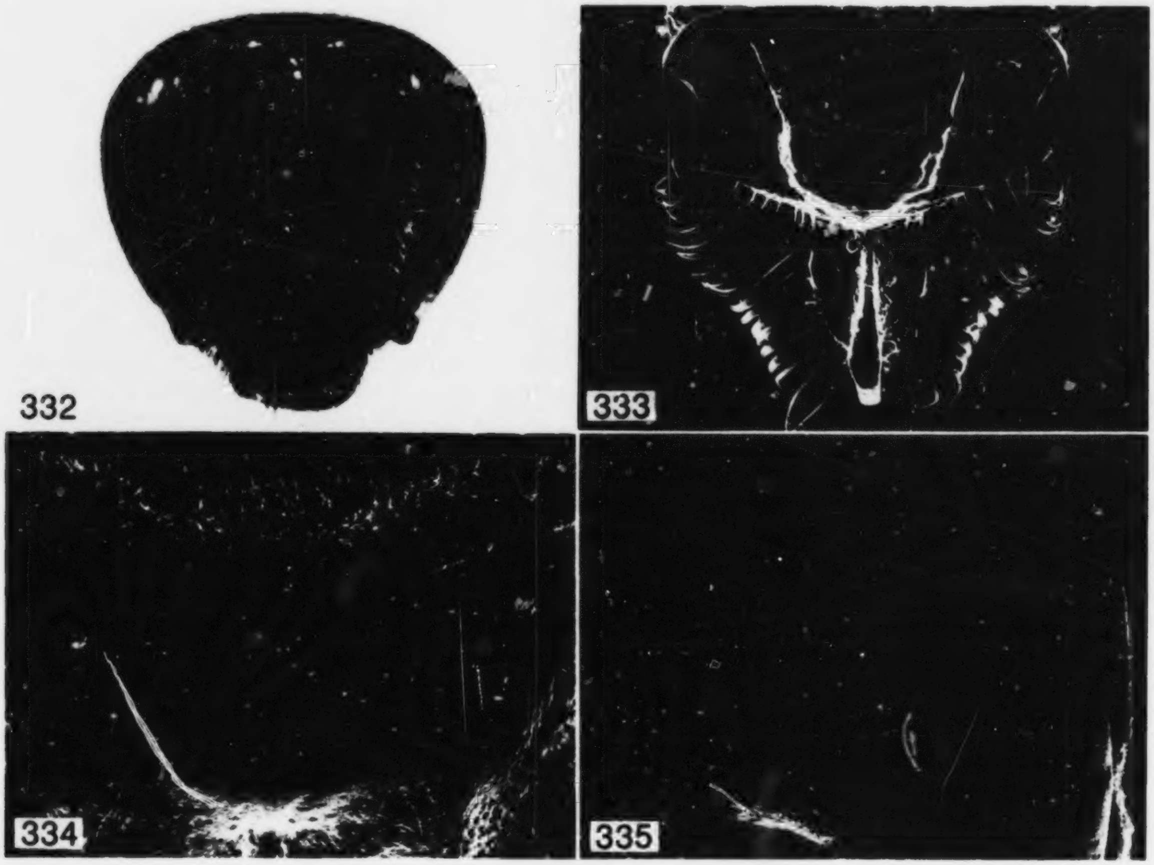
DISTRIBUTION (Figure 258).—*Lasioglossum circinatum* is presently known from only 38 females collected in southern Mexico, from Hidalgo and Michoacan, south to Guatemala (this does not include the additional 13 females in the type series noted by G.C. Eickwort or the two males tentatively associated with this species by Vachal; see above "Type Material" section).

DIAGNOSIS.—*Lasioglossum circinatum* can be recognized by the following character combination: dorsal surface of propodeum nearly entirely smooth, weakly striolate laterally with very weak median striae confined to basal one-third (Figure 334); acarinarium absent, elongate hairs scattered over anterior surface of tergum I; head elongate (Figure 332, length/width ratio 0.92–

1.03, x̄ = 0.97). This character combination will distinguish this species from all other New World *Lasioglossum* except *L. pharum* and *L. troipidonotum*. *Lasioglossum pharum* differs from *L. circinatum* in having the mesoscutum conspicuously doubly-punctate (Figure 604) and having a polished, shiny clypeal surface (the mesoscutum of *L. circinatum* is only obscurely doubly-punctate, appearing entirely granuloso-punctate (Figure 335), and its clypeus is entirely dull-granulate with coarse, elongate punctation). *Lasioglossum tropidonotum* is unique in having a longitudinal median elevation on the anterior edge of the mesoscutum (Figure 174) and has terga IV–V nearly entirely covered by short, adpressed hairs (normal basal hair bands in *L. circinatum*). Other Mexican species having a dull, smooth dorsal propodeal surface are *L. bajaense* and *L. uyacicola* but these species differ from *L. circinatum* in having metasomal acarinaria. The dorsal proprodeal surface of *Lasioglossum argutum* is smooth over its posterior half but is polished and shiny, not dull. The latter species furthermore has a short head (Figure 262, length/width ratio 0.84–1.0, x̄ = 0.89) and is a much smaller bee (body length 7.1–8.6 vs. 8.4–10.2).

DESCRIPTION.—FEMALE: (1) Length 8.4–10.2 mm (x̄ = 9.2, n = 15); (2) wing length 2.3–3.0 mm (x̄ = 2.6, n = 15).

Structure: (4) Head elongate (Figure 332;



FIGURES 332–335.—*Lasioglossum circinatum*, female: 332, head; 333, labrum; 334, propodeum; 335, mesoscutum.

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length/width ratio 0.92–1.03, $\bar{x} = 0.97$, $n = 15$). (7) Supraclypeal area evenly rounded ventrally, somewhat narrowly rounded dorsally along frontal carina, (8) moderately protuberant. (9) Clypeus projecting approximately 0.82 of its length below lower margin of eyes; (11) surface without median longitudinal sulcation. (14) Distance between lateral ocelli subequal to distance between lateral ocellus and eye. (23) Flagellomere 1 longer than 2 along dorsal surface. Labrum as in Figure 333; (27) distal keel moderately broad, widest basally; (28) distal lateral projections virtually absent, evident as obscure swellings; (29) most fimbrial setae bluntly rounded.

(32) Pronotal lateral angle narrowly obtuse; (33) pronotal lateral ridge incomplete, interrupted by oblique lateral sulcus; (34) lower portion of lateral ridge somewhat inconspicuous, rounded. (35) Mesoscutal lip very weakly bilobed, (36) weakly elevated from pronotum. (40) Dorsal surface of propodeum about 0.78 the length of scutellum and about 1.4 times the length of metanotum, (41) slightly depressed centrally, (42) posterior margin broadly rounded; (43) propodeal triangle weakly defined, evident medially as a very low V-shaped elevation without lateral rims; (44) lateral carinae extending slightly beyond midpoint of posterior surface. (45) Tibial spur as in Figure 25.

(46) Lateral edge of metasomal tergum II very weakly sinuate, nearly straight.

Sculpture: (47) Face dull, granular, (48) doubly-punctate, smaller punctures dense, separated by less than their width, larger punctures separated by 1–2 times their width. (51) Supraclypeal area extremely granulate; (52) uniformly punctate, punctures separated by 1–2 times their width. (53) Clypeus moderately granulate throughout; (54) punctation dense, somewhat coarse, punctures separated by less than their width, becoming elongate apically. (56) Mesoscutum moderately shiny; (57) punctation as in Figure 335, obscurely doubly-punctate, smaller punctures extremely dense contiguous throughout, larger punctures 3–5 times their width apart (observable at 50 magnifications or more). (58) Scutellum nearly uniformly punctate, most punctures 1–2 times their width apart, anterior edge with minute, nearly contiguous punctures. (63) Dorsal surface of propodeum (Figure 334) nearly entirely smooth, weakly striolate laterally with very weak median striae confined to basal one-third; (64) surface extensively alveolated. (65) Metasomal tergum I moderately shiny; (66) punctation fine, extremely dense, punctures nearly contiguous.

Coloration: (71) Wing membrane mostly hyaline, marginal cell to apex lightly infuscated.

Vestiture: (72) Unlike most species, hairs between vertex and antennae conspicuously simple, recurved, contrasting with pulmose hairs near antennae; (74) pubescence of head white. (75) Pubescence of thorax white; (76) mesoscutal hairs inconspicuous, moderately sparse and plumose. (77) Hind tibial hair color differentiated, ventral and lateral hairs white, dorsal hairs dark brown to brown. (78) Anterior hairs of metasomal tergum I and (79) basal hair bands of terga II–IV white. (80) Acarinarium absent, elongate hairs scattered over anterior surface of tergum I.

FLIGHT RECORDS.—Females of *L. circinatum* have been collected in all months except March, April, June, and December.

SPECIMENS EXAMINED.—38♀.

GUATEMALA. Mt. Pacaya, 30 Nov 1975, S.W. Batra (1♀; USNM).

MEXICO. HIDALGO: Jacala, 22 mi NE, 18 Jul 1963, G.W. Byers & party (1♀; KU). MEXICO: Istapan de Sal, 1 mi N, 1 Aug 1962, Univ. Kansas Mex. Exped. (1♀; KU). MICHOACAN: Uruapan, Aug 1975, N.L. Krauss, 1600–1700 m (2♀; USNM, KU); Zamora, 28 Aug 1954, E.G. Linsley, J.W. MacSwain, R.F. Smith (1♀; UCB). MORELOS: Cuernavaca, 26 Aug 1956, 6000 ft, R. & K. Dreisbach (1♀; MSUEL), 17 May 1959, 5500 ft, H.E. Evans (1♀; CU), 12–19 Jul 1961, R. & K. Dreisbach (1♀; MSUEL), Oct 1965, N.L. Krauss (1♀; USNM); Tepotzlan, 26 Sep 1957, R. & K. Dreisbach (1♀; MSUEL); Yautepec, 19 Aug 1956, R. & K. Dreisbach (1♀; MSUEL). OAXACA: El Tule, 5 Aug 1964, H.V. Daly (1♀; CAS); Tehuantepec, 64 mi W, 21 Jul 1952, E.E. Gilbert, C.D. MacNeil (1♀; UCB). VERACRUZ: Coscomatepec, 9 Jul 1974, J.A. Chemsak, E. & J. Linsley, J. Powell (3♀; UCB); Fortin de la Flores, 14–21 Sep 1954, F.X. Williams (1♀; CAS); Jalapa, 28 Sep–3 Oct 1961, R. & K. Dreisbach (4♀;

MSUEL); Orizaba, Jan 1945, N.L. Krauss (1♀; USNM), 13 Feb 1954, 2500 ft, R.R. Dreisbach (5♀; KU), 12–22 Aug 1961, R. & K. Dreisbach (2♀; MSUEL), 1862, Biart (female lectotype; MNHNP); Rio Blanco, 13 Nov 1957, R. & K. Dreisbach (5♀; MSUEL); Xico, Texolo Falls, 11 Jan 1982, in ground, 1600–1700 m, B.H. Smith (1♀; KU). UNSPECIFIED LOCALITY: 1867 (female paralectotype; MNHNP).

11. *Lasioglossum citerius* (Vachal)

FIGURES 336, 337

Halictus citerior Vachal, 1904:473 [female].—Cockerell, 1905a:90 [key].

Lasioglossum citerius.—Michener, 1951:1106 [catalog].

TYPE MATERIAL.—The femal holotype of *L. citerius* is in the Naturhistorisches Museum, Vienna. It is labeled

Dup.[?] 1845/citerior Vach.[al] det. J. Vachal/Hal.[ictus] ♀ citerior Vach.[al]/Holotypus [recently handwritten on red label by Ebmer?]/LASIOGLOSSUM ♀ Lasioglossum citeror (Vach. 1904) Holotypus, Unicum det. A.W. Ebmer 1980.

The specimen has been repinned as evidenced by the large hole on the right side of the mesoscutal posterior edge and the additional hole in the thoracic venter; the mouthparts, right front tibia and tarsus are obscured by what appears to be hardened nectar; the right antenna and left front leg are missing.

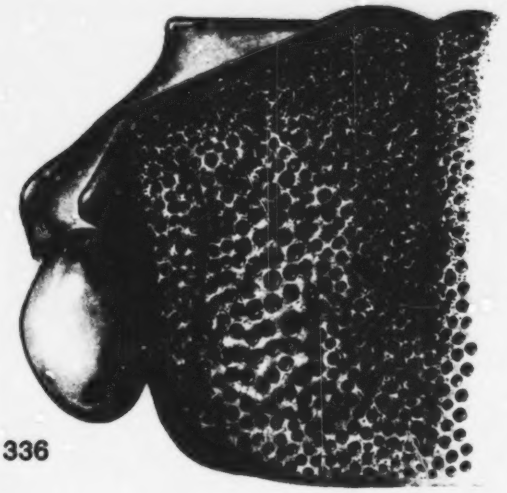
DISTRIBUTION.—*Lasioglossum citerius* is known only from the unique female holotype, which lacks locality data of any kind. As Vachal (1904) indicated in his original description, the specimen appears to be related to *L. pacificum* (and related New World species unknown to Vachal). This is tentatively supported by the shape of the head (broad, as in Figure 545), the structure of the lateral pronotal surface (lower portion of pronotal carina broadly rounded, inconspicuous), and sculpture of the propodeal dorsal surface (Figure 337). Furthermore, *L. citerius* has the unusual dark brown mesoscutal hairs and dark brown hairs on the outer hind tibial surface that are both characteristic of Mexican and Central American *Lasioglossum* and are not found in species occurring north of the Mexican border. From this I conclude that *L. citerius* is most likely a Mexican species; however, because of the uncertainty, it has not been treated in the keys.

DIAGNOSIS.—The combination of the dark brown mesoscutal hairs and the strongly striate propodeal dorsal surface will distinguish *L. citerius* from all other New World *Lasioglossum* except *L. orphnaeum*. The mesoscutum of *L. citerius* is granuloso-punctate anteriorly and medially, but unlike *L. orphnaeum* and all other species, the punctures become conspicuously large and well separated posteriorly (Figure 336; the mesoscutum of *L. orphnaeum* is nearly entirely granuloso-punctate, Figure 548). *Lasioglossum citerius* also differs from other species that have a striate dorsal propodeal surface in that the striae, though conspicuous, become weak posteriorly and fail to reach the posterior propodeal margin (Figure 337). Other characters helpful for recognizing *L. citerius* are the broad head (as in Figure 545), the broadly rounded, inconspicuous lower portion of the pronotal lateral carina (as in *L. pacificum* and related species) and the sharply pointed pronotal lateral angle (Figure 336).

DESCRIPTION.—FEMALE: (1, 2, 3) Measurements of the holotype were unfortunately not recorded; the specimen is a moderately sized *Lasioglossum;* Vachal (1904) gave 8 mm for the length.

Structure: (4) Head short (as in Figure 545); length/width ratio 0.88 (n = 1). (7) Supraclypeal area evenly rounded, (8) weakly protuberant. (9) Clypeus projecting approximately 0.50 of its length below lower margin of eyes; (11) surface without median longitudinal sulcation. (14) Distance between lateral ocelli subequal to distance between lateral ocellus and eye. (23) Flagellomere 1 slightly shorter than 2 along dorsal surface. (23, 26, 27, 28) Labrum not examined due to uniqueness of specimen and soiled condition of mouthparts.

(32) Pronotal lateral angle forming well-produced right angle; (33) pronotal lateral ridge incomplete, broadly interrupted by oblique lateral sulcus; (34) lower portion of lateral ridge inconspicuous, broadly rounded. (35) Mesoscutal lip strongly bilobed, (36) conspicuously elevated



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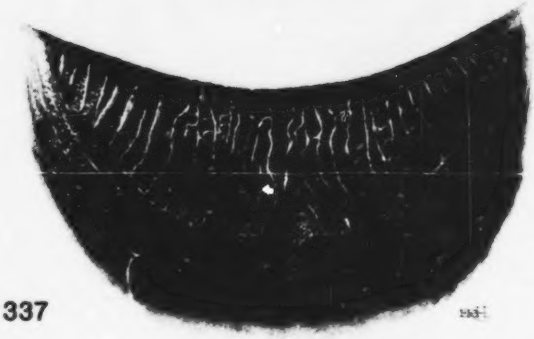

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FIGURES 336, 337.—*Lasioglossum citerius*, female holotype: 336, mesoscutum; 337, propodeum.

from pronotum. (40) Dorsal surface of propodeum about 0.80 the length of scutellum and about 1.7 times the length of metanotum, (41) moderately depressed centrally, (42) posterior margin broadly rounded; (43) propodeal triangle defined by conspicuous but noncarinate lateral rims, median V-shaped area not produced; (44) lateral carinae well developed, not quite reaching dorsal propodeal surface (lateral carinae join conspicuous longitudinal carinae that parallel the dorsal propodeal rim, Figure 337). (45) Tibial spur not removed for study; appears to have one large, conspicuous tooth followed by few, broad, weakly projecting teeth (similar to that of *L. argutum*, Figure 18).

(46) Lateral edge of metasomal tergum II nearly evenly rounded, only slightly flattened posteriorly.

Sculpture: (47) Face shiny, (48) densely and contiguously punctate below ocelli to antennae. (51) Supraclypeal area conspicuously granulate; (52) punctures obscure, separated by their width. (53) Clypeus granulate basally and medially, apicolateral areas polished; (54) punctures obscure basally, becoming well defined and separated by their width on apical half. (56) Mesoscutum dull anteriorly, shiny on posterior half; (57) punctation as in Figure 336: roughly granuloso-punctate anteriorly and medially, punctures becoming conspicuously large and well separated by at least their width posteriorly. (58) Scutellum granuloso-punctate around margins, less densely punctate adjacent to midline with some punctures separated by their width or slightly more. (63) Dorsal surface of propodeum (Figure 337) strongly striate laterally with striae reaching posterior propodeal margin, striae strong and regular medially over basal three-quarters but become weak and obscure near posterior edge of propodeal dorsal surface; (64) surface appears to be alveolated near posterior edge where striae become obscure. (65) Metasomal tergum I shiny; (66) punctation fine, dense, punctures slightly less than their width apart.

Coloration: (71) Wing membrane nearly hyaline, very lightly pigmented.

Vestiture: (74) Pubescence of head pale yellowish brown with some dark brown hairs interspersed (especially on vertex). (75) Pubescence of thorax mostly white or off-white, hairs on mesoscutum and scutellum dark brown; (76) mesoscutal hairs moderately dense and plumose. (77) Hind tibial hair color differentiated, most hairs white to pale brown, dorsal hairs dark brown. (78) Anterior hairs of metasomal tergum I and (79) basal hair bands of terga II–IV white. (80) Acarinarium absent, elongate hairs scattered over anterior surface of tergum I (most of these hairs on the holotype have been worn off).

12. *Lasioglossum colatum* (Vachal), new combination

FIGURES 26, 338–352

Halictus colatus Vachal, 1904:476 [male].—Cockerell, 1907:242 [incorrect synonymy with *H. trizonatus*].
Halictus ripariellus Cockerell, 1918b:261 [female]. [New synonymy.]
Lasioglossum ripariellum.—Michener, 1951:1107 [Nearctic catalog].—Hurd, 1979.1958 [Nearctic catalog].

TYPE MATERIAL.—The male holotype of *Halictus colatus* is in the Naturhistorisches Museum, Vienna. It is labeled

Morrison [Jefferson County] Colorado 1879. [indecipherable character]/colatus Vach[al] det. J. Vachal/Hal[ictus] colatus Vach[al] ♂ [handwritten].

The specimen is in fair condition; it is missing the last 10 flagellomeres of the right antenna and has had the head and pronotum glued to the thorax. When received for study in September 1983, the abdomen was loosely connected to the thorax and was secured with a small drop of polyvinyl acetate.

The female holotype of *Halictus ripariellus* is in the California Academy of Sciences, San Francisco. It is labeled

Holotype [on red label]/Florissant [Teller County], Colo.[rado] Expedition 1907. Coll.[ector] Ckll. [Cockerell] June 26/nesting in bank [handwritten by Cockerell]/Halictus ripariellus Ckll. TYPE. [handwritten by Cockerell].

The specimen is missing the last two tarsomeres of the left hind leg and the last tarsomere of the right hind leg but otherwise is in excellent condition.

DISTRIBUTION (Figure 338).—Both Nearctic catalogs reported *Lasioglossum colatum* only from Colorado. It is now known to occur widely in the West from southern British Columbia and Edmonton, Alberta, south to southern Utah and Colorado and through the Sierra Nevada to Alpine County, California. Eastern-most records are from Wyoming and central Colorado, with one female collected from Hanna (Meade Co.), South Dakota, in 1936 (Cornell University Collection).

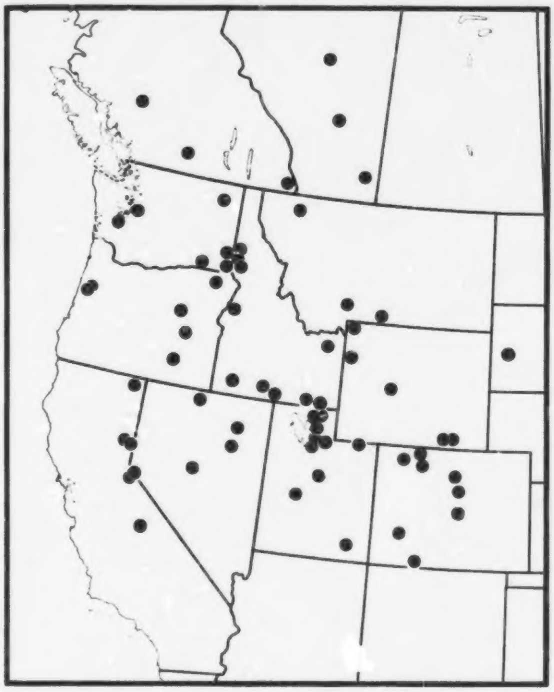


FIGURE 338.—Distribution of *Lasioglossum colatum*.

DIAGNOSIS.—Females of *Lasioglossum colatum* can be recognized by their weakly developed but distinctive acarinarium on the anterior surface of the first metasomal tergum (Figure 351): elongate lateral fringe hairs are present but are sparse and form only an indistinct border around the central glabrous area; furthermore, a distinctive patch of short, adpressed hairs is present in the dorsal acarinarial opening. Other characters useful in recognizing *L. colatum* are the relatively sparse mesoscutal punctation that is obscurely doubly-punctate (Figure 344) and the moderately short head (Figure 339; length/width ratio 0.88–0.96, $\bar{x} = 0.92$). *Lasioglossum colatum* females are most commonly confused with those of the *forbesii* and *trizonatum* groups; however, the acarinarium in the latter species is more strongly developed in having conspicuous lateral hair fringes (Figures 111, 114) and the mesoscutal punctation of both species is denser than that of *L. colatum* (Figures 439, 675). *Lasioglossum forbesii*, sensu lato, can further be differentiated from *L. colatum* in having the posterior rim of the dorsal propodeal surface slightly elevated (Figure 438; rounded in *L. colatum*, Figure 343). The elongate heads of *L. trizonatum*, sensu lato, (Figures 683, 709) will readily separate them from *L. colatum*.

The male of *Lasioglossum colatum* has a round, short head (Figure 340) and a broadly rounded clypeus (not flattened as in most other *Lasioglossum* males). Also diagnostic is the elongate, slender tergum I as seen from above (Figure 343). Males of *L. athabascense* also have a rounded head and a rounded clypeus but differ in having long, erect hair tufts on the lateral edges of sternum V (Figure 294).

DESCRIPTION.—FEMALE: (1) Length 7.4–9.8 mm ($\bar{x} = 8.3$, $n = 15$); (2) wing length 2.3– 2.7 mm ($\bar{x} = 2.4$, $n = 15$); (3) abdominal width 2.4–2.8 mm ($\bar{x} = 2.7$, $n = 15$).

Structure: (4) Head moderately short (Figure 339); length/width ratio 0.88–0.96, $\bar{x} = 0.92$, $n = 15$. (7) Supraclypeal area evenly rounded, (8) moderately protuberant. (9) Clypeus projecting approximately 0.84 of its length below lower margin of eyes; (11) surface slightly protuberant towards ventral edge, without median longitudinal sulcation. (14) Distance between lateral ocelli subequal to distance between lateral ocellus and eye. (23) Flagellomere 1 longer than 2 along dorsal surface. Labrum as in Figure 341; (27) distal keel narrow in frontal view, nearly parallel-sided; (28) distal lateral projections well developed, triangular; (29) fimbrial setae acutely pointed.

(32) Pronotal lateral angle narrowly obtuse; (33) pronotal lateral ridge incomplete, interrupted by oblique lateral sulcus; (34) lower portion of lateral ridge inconspicuous, broadly rounded. (35) Mesoscutal lip weakly bilobed, (36) moderately elevated from pronotum. (40) Dorsal surface of propodeum about 0.88 the length of scutellum and about 1.7 times the length of metanotum, (41) slightly depressed centrally, (42) posterior margin rounded; (43) propodeal triangle weakly impressed, evident medially as an inconspicuous V-shaped elevation with low lateral rims; (44) lateral carinae extending to midpoint of posterior surface. (45) Tibial spur as in Figure 26.

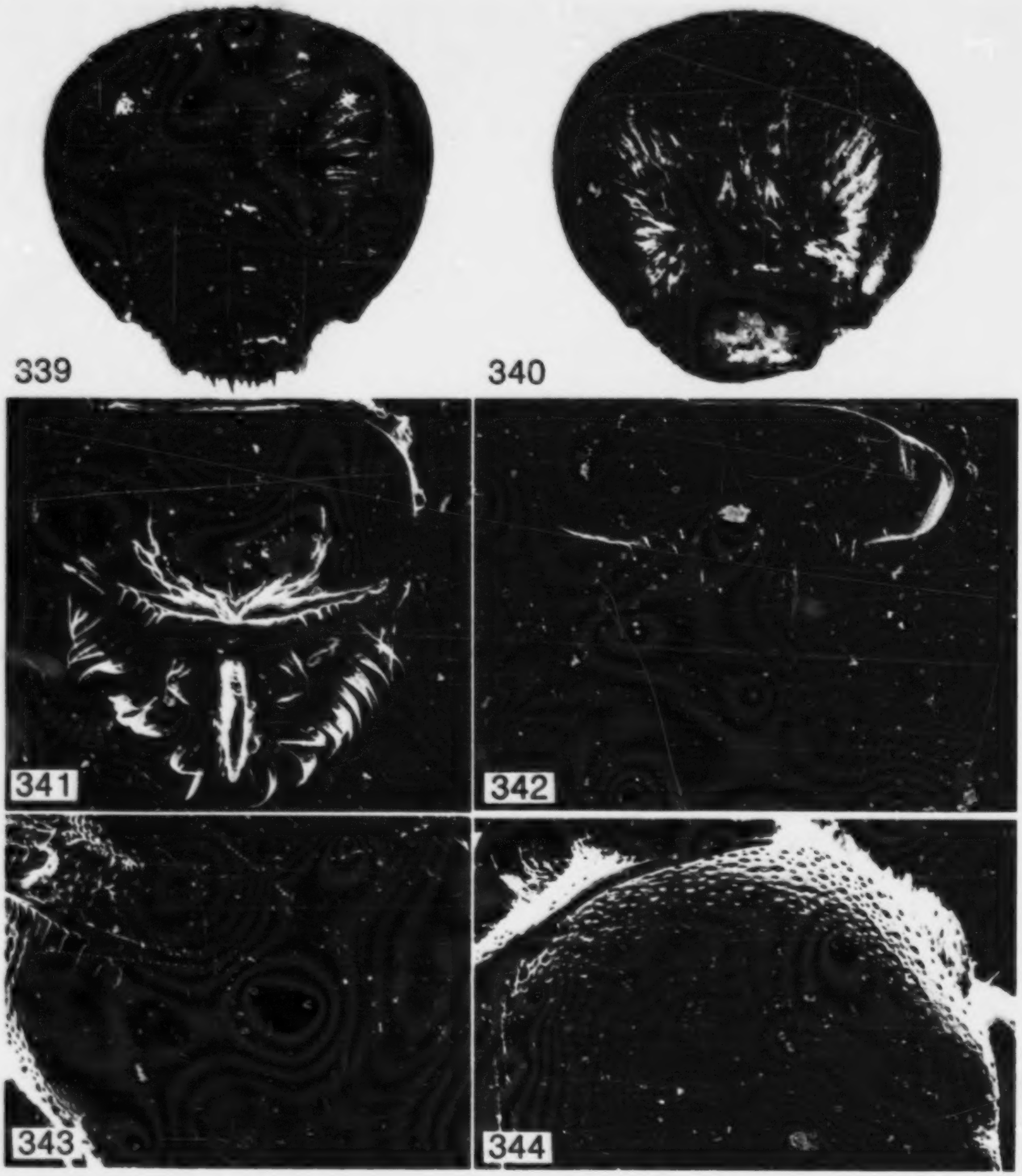
(46) Lateral edge of metasomal tergum II weakly sinuate.

Sculpture: (47) Face shiny, (48) densely punctate below ocelli, punctures contiguous, becoming larger and less dense near antennae. (51) Supraclypeal area very weakly granulate, nearly polished; (52) punctures separated by their width laterally, becoming impunctate centrally. (53) Clypeus polished or at most obscurely granulate over basal third; (54) punctation sparse, punctures separated by 1–2 times their width basally, nearly impunctate apicolaterally. (56) Mesoscutum moderately shiny; (57) punctation as in Figure 344, doubly-punctate, smaller punctures 1–3 times their width apart, larger punctures 3–5 times their width apart, less dense centrally. (58) Scutellum sparsely punctate adjacent to median line, punctures 2–3 times their width apart. (63) Dorsal surface of propodeum (Figure 343) striolate laterally, becoming ruguloso-striolate to finely rugulose medially, striae and rugulae reaching posterior margin; (64) surface obscurely alveolated. (65) Metasomal tergum I moderately shiny; (66) punctation fine, dense, punctures slightly less than their width apart.

Coloration: (71) Wing membrane pale yellowish brown.

Vestiture: Pubescence of head pale yellowish brown. (75) Pubescence of thorax white to pale yellowish brown; (76) mesoscutal hairs moderately sparse, not conspicuously plumose. (77) Hind tibial hairs concolorous, pale yellowish brown. (78) Anterior hairs of metasomal tergum I and (79) basal hair bands of terga II–IV white. (80) Acarinarium present but weakly defined (Figure 351), a small glabrous area at base of tergum I surrounded laterally by scattered elongate hairs, not forming distinct fringe; short, adpressed hairs present dorsolaterally; opening of acarinarium wide, indistinctly defined, wider than lateral hair fringe as seen in dorsal view.

MALE: Similar to female except as follows: (1) length 6.5–8.3 mm ($\bar{x} = 7.1$, $n = 15$); (2) wing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FIGURES 339–344.—*Lasioglossum colatum:* 339, female head; 340, male head; 341, female labrum; 342, male labrum; 343, female propodeum; 344, female mesoscutum.

length 1.8–2.1 mm ($\bar{x} = 2.0$, n = 15); (3) abdominal width 1.8–2.1 ($\bar{x} = 2.0$, n = 15). (4) Head as in Figure 340 (length/width ratio 0.86–0.95, $\bar{x} = 0.90$, n = 15). (5) Gena slightly wider than eye, (6) moderately produced posteriorly. (10) Clypeal surface noticeably rounded dorsally, contrasting with shallow ventral depression. Labrum as in Figure 342; (24) distal process weakly developed, broadly to narrowly rounded; (25) basal area depressed medially; (26) basal lateral depressions present, moderately developed. (30) Mandible short, just reaching opposing clypeal angle. (53) Clypeus polished; (54) punctures well formed and dense along basal edge, apical two-thirds virtually impunctate, punctures very fine and scattered. (68) Clypeal maculation present (Figure 340). (69) Flagellum light brown ventrally, contrasting with dark dorsum. (72) Tarsi dark, concolorous with tibiae.

Vestiture: Sternal vestiture as in Figure 345; (82) hairs on sternum IV erect, longer at midline than laterally; (83) sternum V with median rosette of moderately short, erect hairs that become longer laterally, erect hairs reaching lateral margin of sternum or with erect hairs confined to central portion of sternum.

Terminalia: Sterna VII–VIII as in Figure 350; (85) sternum VIII with short, narrowly rounded median process. Genitalia as in Figures 346–349; (86) gonobase moderately elongate; (87) gonostylus broad, apex narrowly rounded; (89) retrorse membranous lobe narrow, parallel-sided; (90) volsella with very prominent lateral lobe.

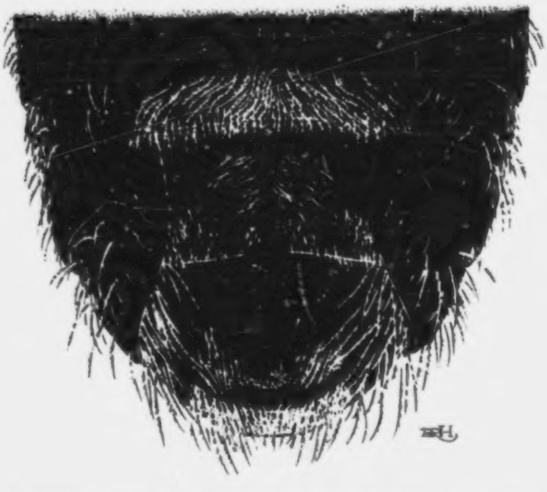


FIGURE 345.—*Lasioglossum colatum*, male sternal vestiture.

Flight Records (Figure 352).—*Lasioglossum colatum* females have been collected from March through early October, with most records coming from June and July, with a peak in early July. The one female taken in March was from Franklin County, Idaho (8 Mar 1969); the one October record is from Nez Perce County, Idaho (1 Oct 1944). Males have been taken from July through early September.

Flower Records.—Females (21): Compositae 61%; Salicaceae 17%. Total: 21 in six families, eight genera as follows:

Clematis 1♀; *Euphorbia* 2♀; *Rosa* 1♀; *Rudbeckia* 1♀; *Salix* 2♀; *Scrophularia* 1♀; *Senecio* 1♀; *Taraxacum* 12♀.

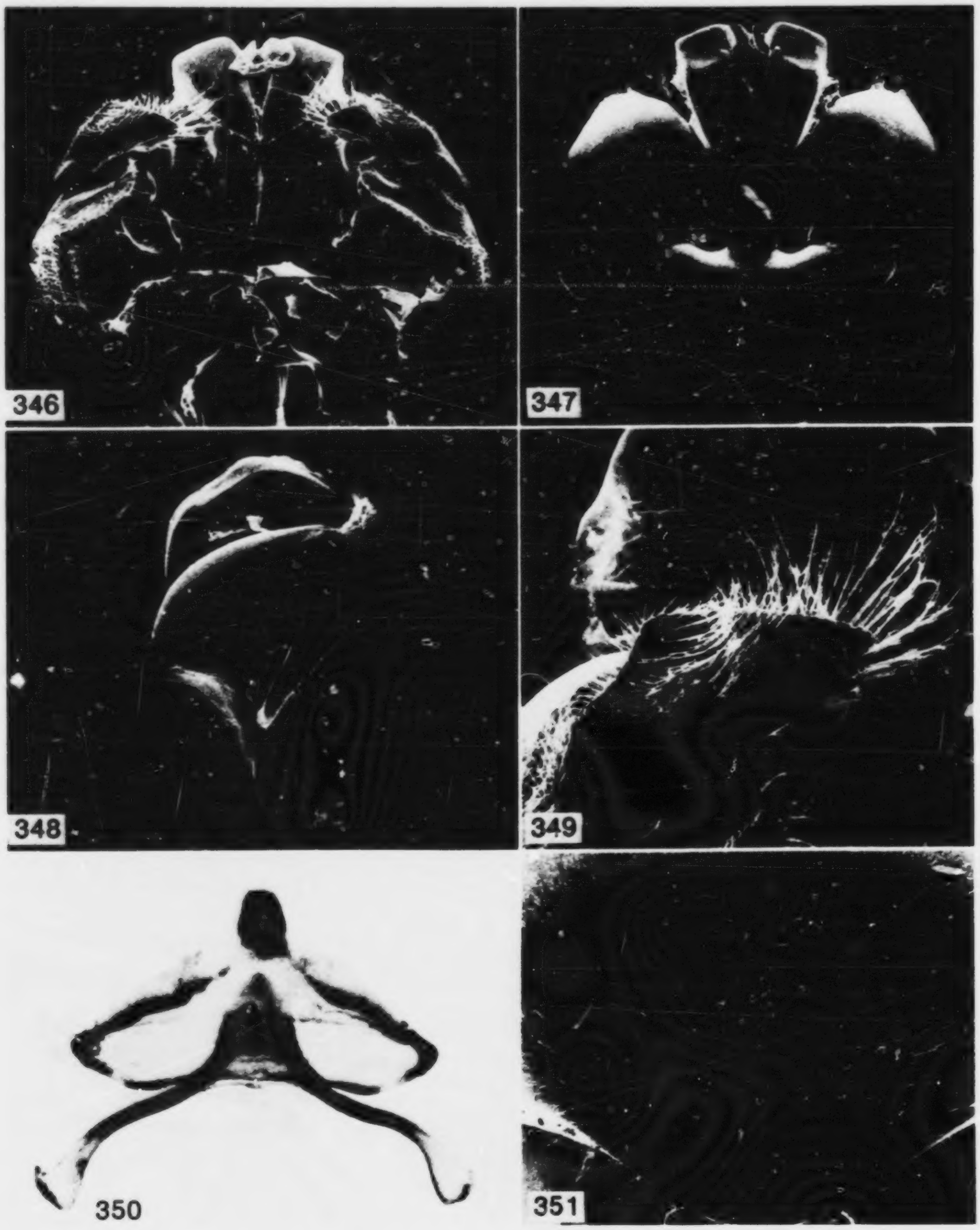
Mite Associates.—Although the acarinarium of *L. colatum* is only very weakly developed (Figure 351), 17 (6.8%) of the females examined were associated with phoretic mites.

Specimens Examined.—277 (265♀, 12♂).

CANADA. Alberta: Drumheller, Edmonton, Elkwater, Medicine Hat. British Columbia: Fernie, Lillooet, OK Falls, Summerland.

UNITED STATES. California: *Alpine Co.:* Markleeville, Woodfords; *Fresno Co.:* Pioneer Basin; *Lassen Co.:* Hallelujah Junction; *Modoc Co.:* Davis Creek; *Plumas Co.:* Frenchmans Lake. Colorado: *Archuleta Co.:* Pagosa Springs; *Boulder Co.:* Boulder; *Jefferson Co.:* Morrison; *Moffat Co.:* Lay; *Ouray Co.:* Ouray; *Routt Co.:* Columbine (4 mi N), Steamboat Springs (4 mi E); *Teller Co.:* Florissant. Idaho: *Adams Co.:* Council, New Meadows; *Cassia Co.:* Elba-Basin Pass, Oakley, 5 min NW: *Franklin Co.; Fremont Co.:* St. Anthony; *Latah Co.; Nez Perce Co.:* Lewiston; *Oneida Co.; Owyhee Co.:* Little Valley; *Twin Falls Co.:* Magic Mt., near Twin Falls. Montana: *Flathead Co.:* Glacier National Park, West Glacier; *Gallatin Co.:* Bozeman, Squaw Creek.

Nevada: *Carbon Co.:* Rosebud Canyon; *Douglas Co.:* Dagget Pass; *Elko Co.:* Deeth, Lamoile Lake; *Eureka Co.:* Red House Ranch; *Humboldt Co.:* Lye Creek Camp (18 mi N Paradise Valley); *Lander Co.:* Austin Summit (2.5 mi E), Blackbird Ranch (10 mi SE Austin). Oregon: *Benton Co.:* Alsea Mount, Corvallis; *Grant Co.:* Sheep Mt. Road, Summit Prairie; *Harney Co.:* Fish Lake (16 mi E Frenchglen), Frenchglen, North Fork Malheur River; *Wallowa Co.:* Minam State



FIGURES 346–351.—*Lasioglossum colatum:* 346, male genitalia, ventral view; 347, same, dorsal view; 348, same, lateral view; 349, male gonostylus; 350, male sterna VII–VIII; 351, female acarinarium at base of tergum I.

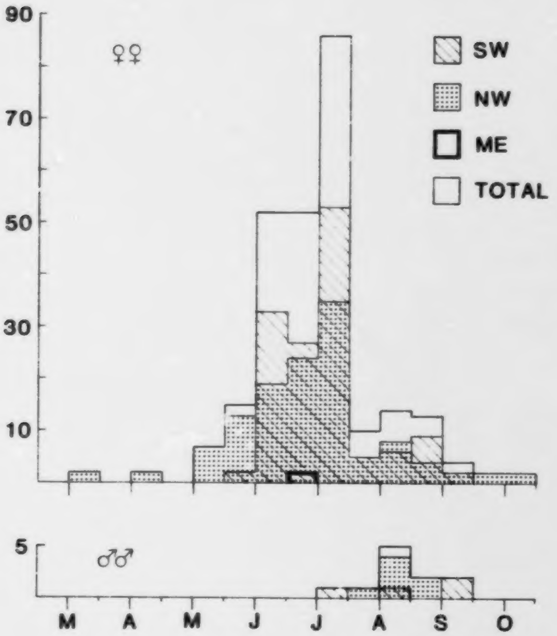


FIGURE 352.—*Lasioglossum colatum* flight records.

Park. SOUTH DAKOTA: *Meade Co.:* Hanna. UTAH: *Box Elder Co.; Cache Co.; Daggett Co.; Davis Co.:* Framington; *Millard Co.:* Fillmore; *Salt Lake Co.:* Parleys Canyon, Salt Lake City; *San Juan Co.:* Hide Out Canyon; *Sanpete Co.:* Indianola; *Summit Co.:* Wanship; *Weber Co.:* Liberty, Willard Basin, Wolf Creek. WASHINGTON: *Asotin Co.:* Asotin; *King Co.:* Maple Valley; *Stevens Co.:* Colville, 4 mi S; *Thurston Co.:* Olympia; *Walla Walla Co.:* Walla Walla; *Whitman Co.:* Pullman. WYOMING: *Albany Co.:* Laramie, Medicine Bow National Forest; *Fremont Co.:* Lander; *Teton Co.:* Grand Teton National Park; *Uinta Co.:* unspecified locality.

13. *Lasioglossum coriaceum* (Smith)

FIGURES 27, 64, 72–74, 353–364

Halictus coriaceus Smith, 1853:70 [female].—Provancher, 1882:199; 1883:699; 1888:316.—Robertson, 1894:435–480 [flower records].—Dalla Torre, 1896:59 [World catalog].—Cockerell, 1898c:50 [key, taxonomic notes]; 1905b:349 [taxonomic note].—Crawford, 1906:303 [taxonomic notes].—Graenicher, 1906:13 [flower record]; 1907:84–95 [flower records].—Lovell, 1908:34 [locality and flower records].—Graenicher, 1909:19–77 [flower records].—Brittain and Newton, 1933:344 [flower record]; 1934:262 [flower records].—Cockerell, 1949:446 [comparison to *H. uyacensis*].

Halictus subquadratus Smith, 1853:72 [male].

Halictus 6-cinctus Provancher, 1882:200 [male].

Halictus sexcinctus Provancher.—Dalla Torre, 1896:59 [emendation].

Halictus coniaceus.—Cockerell, 1918b:261 [lapsus calami].

Curtisapis coriacea Robertson, 1918:91 [key].—Reinhard, 1924:371 [predator, *Philanthus gibbosus* (Fabricius)].—Robertson, 1929 [flower records].

Lasioglossum coriaceum.—Robertson, 1902:247 [key].—Michener, 1951:1106 [Nearctic catalog].—Evans and Lin, 1959:123, 130 [predator, *Philanthus gibbosus*].—Mitchell, 1960:338, 339, 341 [key, redescription].—Knerer and Atwood, 1962:163 [locality and flower records].—Hurd, 1979:1957 [Nearctic catalog].—Eickwort, 1979:577 [mites].—Hurd et al., 1980:27, 65 [flower records].—Duffield et al., 1981:323 [Dufour's gland chemistry].

TYPE MATERIAL.—The female holotype of *Halictus coriaceus* is labeled

Type H.T. [circular label with orange-red border]/B.M. TYPE HYM. 14.a.998/B.M. TYPE HYM. Halictus coriaceus Smith 1853 [handwritten]/coriaceus Sm.[Smith] Type [handwritten]/Ent. club 44-12.

The specimen is in poor condition, missing the front left wing, the front and middle legs on the left side as well as the last two tarsomeres of the hind left leg. The left hind wing is partially broken at the base. The holotype is in the British Museum (Natural History).

The male holotype of *Halictus subquadratus*, also in the British Museum, is missing both hind legs beyond the coxae and the distal three tarsomeres of the middle left leg. During shipment in November, 1983, the abdomen broke off behind the first metasomal segment and has been placed in a plastic genitalia capsule attached to the specimen pin. The specimen is labeled.

Type H.T. [circular label with orange-red border]/B.M. TYPE HYM. 17.a.1003/B.M. TYPE HYM. Halictus subquadratus Smith 1853 [handwritten]/subquadratus Sm.[Smith] (Type) [handwritten]/11 [illegible numbers] 490 [handwritten]/Ent. Club. 44 12.

DISTRIBUTION (Figure 353).—*Lasioglossum coriaceum* is a very common eastern bee found from Cape Breton Island south to northern Georgia and west to Minnesota and eastern Kansas. Three isolated western records are one female from Glenboro, Manitoba (CNC), seven females from Pennington County, South Dakota (AMNH), and one female from Sioux County,

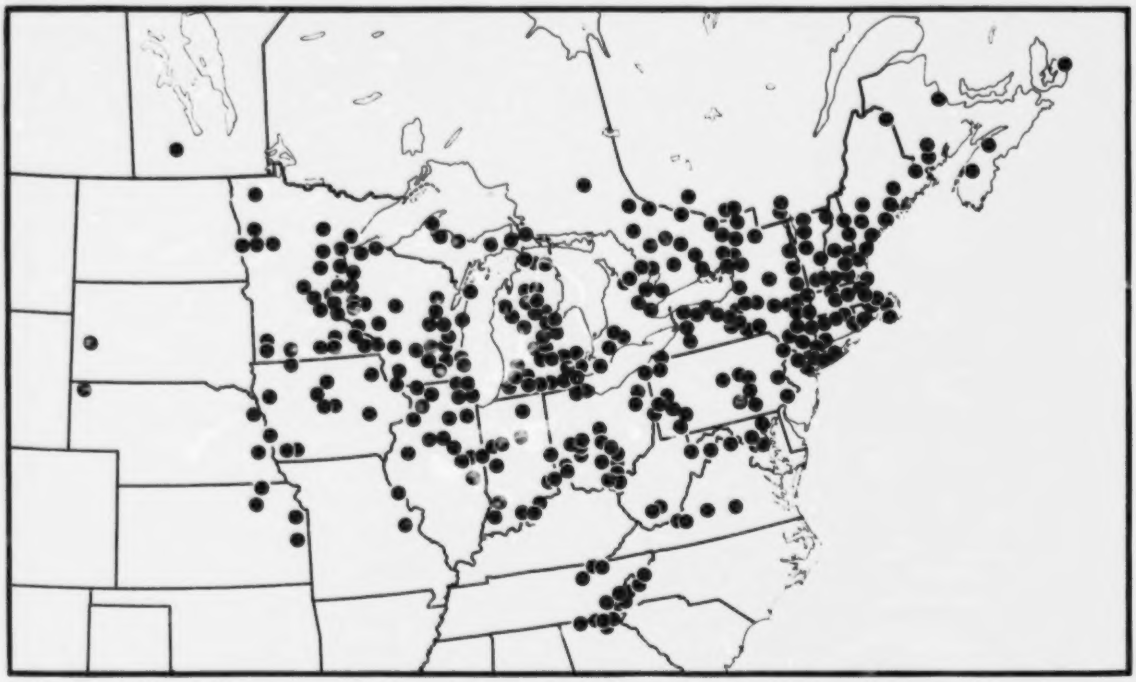


FIGURE 353.—Distribution of *Lasioglossum coriaceum*.

Nebraska (University of Nebraska). Both nearctic catalogs incorrectly report this species as far west as Alberta and New Mexico; however, these western records are most likely based on misidentifications of *L. forbesii* (sensu lato) and *L. trizonatum* (sensu lato). One male in the USNM labeled "Florida" (no additional data) may be mislabeled.

DIAGNOSIS.—The female of *Lasioglossum coriaceum* can be distinguished from all other known New World *Lasioglossum* by the acarinarium on the first metasomal tergum, which is completely enclosed by a circular fringe of elongate hairs (Figure 72). All other species having acarinaria have a dorsal acarinarial opening that is narrow (Figure 408) to very wide (Figure 393). The acarinarium of *L. acuminatum* is most similar to that of *L. coriaceum* in being nearly completely enclosed by fringe hairs, but even here there is a very narrow dorsal opening (Figure 407). Another highly diagnostic feature of *L. coriaceum* is the very low mesoscutal anterior edge, which is only slightly elevated from the pronotum (as in Figure 87; compare to Figure 90). The only other species having a low mesocutal edge is *L. transvorsum*, a Mexican species that differs from *L. coriaceum* in having a densely granuloso-punctate mesoscutum (Figure 649) and by lacking an acarinarium. Other helpful characters for recognizing *L. coriaceum* females are the smooth posterior half of the dorsal propodeal surface (Figure 358) and the strongly sinuate lateral edge of the second metasomal tergum (Figure 64; a similar tergal edge is found only in *L. anhypops* and *L. trizonatum* from the western United States).

The anterior mesoscutal edge in male *L. coriaceum* is flush with the pronotum and not even slightly raised as in the females. In addition, the males have subquadrate heads with strongly produced genae and extremely elongate mandibles that reach the opposing mandibular bases. In the eastern United States only the male of *L. acumi-*

natum has similar elongate mandibles that are slightly shorter than those of *L. coriaceum*, reaching just short of the opposing mandibular bases. However, ***Lasioglossum acuminatum*** has an elevated mesoscutal edge and yellow tarsi (tarsi dark, concolorous with the tibiae in *L. coriaceum*).

DESCRIPTION.—FEMALE: (1) Length 8.3–11.2 mm ($\bar{x}$ = 9.8, n = 20); (2) wing length 2.7–3.1 mm ($\bar{x}$ = 2.9, n = 20); (3) abdominal width 2.6–3.5 mm ($\bar{x}$ = 3.0, n = 20).

Structure: (4) Head elongate (Figure 354); length/width ratio 0.89–1.0, $\bar{x}$ = 0.94, n = 34. (7) Supraclypeal area evenly rounded, (8) moderately protuberant. (9) Clypeus strongly projecting below lower margin of eyes by approximately 0.86 of its length; (11) surface without median longitudinal sulcation. (14) Distance between lateral ocelli subequal to distance between lateral ocellus and eye. (23) Flagellomere 1 slightly shorter than 2 along dorsal surface. Labrum as in Figure 356; (27) distal keel moderately broad in frontal view, slightly wider basally; (28) distal lateral projections moderately well developed, triangular; (29) fimbrial setae acutely pointed.

(32) Pronotal lateral angle narrowly obtuse; (33) pronotal lateral ridge incomplete, interrupted by oblique lateral sulcus; (34) lower portion of lateral ridge sharply edged. (35) Mesoscutal lip rounded, not bilobed, (36) very weakly elevated from pronotum. (40) Dorsal surface of propodeum about 0.89 the length of scutellum and about 1.7 times the length of metanotum, (41) not noticeably depressed centrally, (42) posterior margin broadly rounded; (43) propodeal triangle weakly defined, median portion not elevated, lateral rims absent; (44) lateral carinae extending at most to midpoint of posterior surface. (45) Tibial spur as in Figure 27.

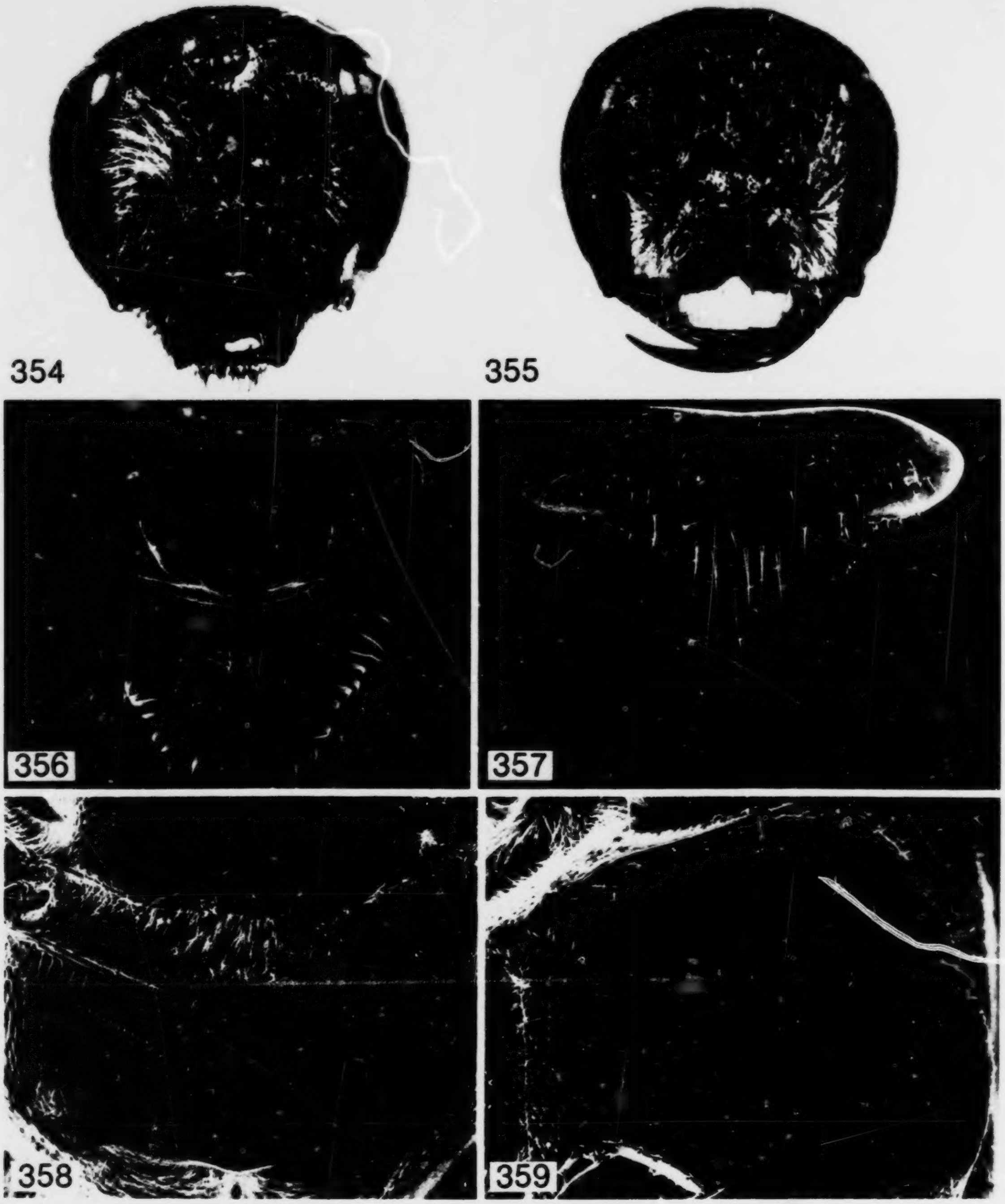
(46) Lateral edge of metasomal tergum II very strongly sinuate (Figure 64).

Sculpture: (47) Face shiny, (48) densely punctate below ocelli, punctures contiguous, becoming larger and less dense near antennae. (51) Supraclypeal area polished, (51) punctures separated by their width laterally, separated by 2–4 times their width centrally. (53) Clypeus polished; (54) punctures well formed, separated by their width or less along basal edge, becoming sparse centrally, separated by 1–2 times their width, apical edge and apicolateral areas largely impunctate. (56) Mesoscutum dull (57) punctation as in Figure 359, punctures variable in size, not distinctly doubly-punctate; punctures separated by their width laterally, becoming less dense anteriorly and centrally, punctures separated by 1–4 times their width. (58) Scutellum sparsely punctate adjacent to median line, punctures separated by 2–3 times their width. (63) Dorsal surface of propodeum incompletely striolate, striae reaching posterior surface laterally, confined to basal one-third medially (Figure 358); (64) surface alveolated. (65) Metasomal tergum I moderately shiny; (66) punctation fine, dense, punctures slightly less than their width apart.

Coloration: (71) Wing membrane light yellowish brown, somewhat clearer towards apex.

Vestiture: (74) Pubescence of head pale yellowish brown. (75) Pubescence of thorax mostly pale yellowish brown, white on pronotal lateral angle, pronotal lobe, and metanotum; (76) mesoscutal hairs moderately sparse and plumose. (77) Hind tibial hairs concolorous, yellowish brown. (78) Anterior hairs of metasomal tergum I pale yellowish brown, (79) basal hair bands of terga II–IV white. (80) Acarinarium present (Figure 72), a relatively small circular, glabrous area at base of tergum I, completely encircled by elongate fringe hairs, dorsal opening of acarinarium absent.

MALE: Similar to female except as follows: (1) length 6.8–9.8 mm ($\bar{x}$ = 8.1, n = 20); (2) wing length 1.8–2.5 mm ($\bar{x}$ = 2.3, n = 20); (3) abdominal width 1.8–2.8 mm ($\bar{x}$ = 2.1, n = 20). (4) Head as in Figure 355 (length/width ratio 0.83–0.96, $\bar{x}$ = 0.93, n = 20). (5) Gena wider than eye, (6) strongly produced posteriorly. (10) Clypeal surface shallowly depressed ventrally. Labrum as in Figure 357; (24) distal process present, developed as a flat, acute projection; (25) basal area weakly depressed medially; (26) basal lateral



FIGURES 354–359.—*Lasioglossum coriaceum:* 354, female head; 355, male head; 356, female labrum; 357, male labrum; 358, female propodeum; 359, female mesoscutum.

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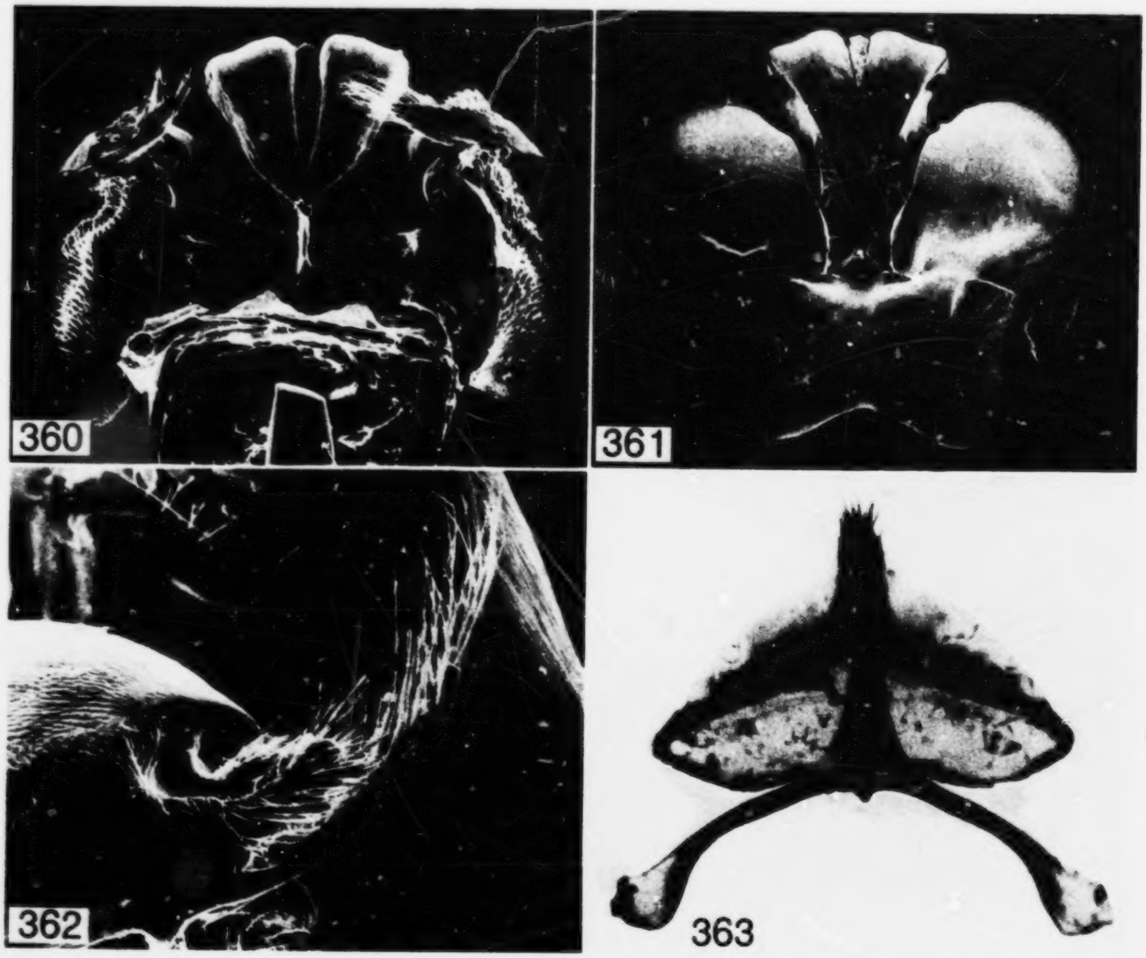
depressions absent. (30) Mandible extremely elongate, reaching opposing mandibular base. (53) Clypeus polished; (54) punctures well formed and dense basally, very fine and scattered over apical two-thirds. (68) Clypeal maculation present (Figure 355). (69) Flagellum entirely dark or with ventral surface slightly paler than dorsum. (72) Tarsi dark, concolorous with tibiae.

Vestiture: (82) Hairs on sternum IV erect, elongate, longer at midline than laterally; (83) sternum V with relatively inconspicuous median rosette of short erect hairs, posterior edge of sternum with short, broadly rounded, adpressed hair lobes.

Terminalia: Sterna VII–VIII as in Figure 363; (85) sternum VIII with short, narrowly rounded median process. Genitalia as in Figures 360–362; (86) gonobase moderately elongate; (87) gonostylus moderately broad basally, gradually tapering to acute apex; (89) retrorse membranous lobe moderately broad; (90) volsella with very prominent lateral lobe.



FIGURES 360–363.—*Lasioglossum coriaceum*, male: 360, genitalia, ventral view; 361, same, dorsal view; 362, gonostylus; 363, sterna VII–VIII.

FLIGHT RECORDS (Figure 364).—*Lasioglossum coriaceum* females have been collected from the second half of March through early October, with most records from late June. Virtually all male records are from July through October. Unusual records are as follows: one male from Rockville, Pennsylvania, 25 May 1910; one male from Dorset, Ontario, 21 May 1961; two in June (Mattituck, New York, 4 Jun 1934; Hemmingford, Quebec, 24 Jun 1916) and one in November (Great Falls, Virginia, 10–18 Nov 1978). In the northern part of the species distribution-range, male records peak in early September, whereas males to the south peak in the second half of August.

FLOWER RECORDS.—Floral data indicates that *L. coriaceum* is broadly polylectic. Hurd et al. (1980) have reported this species as being a "casual polylege" of *Helianthus*. The 332 females examined in this study that had associated floral data were taken nearly equally from flowers of the Compositae, Cruciferae, Leguminosae, and Rosaceae. These four families accounted for 71% of all female flower records; 46 females were noted to have full to nearly full pollen loads and these were taken from flowers representing six families.

Summary: Females (332): Rosaceae 22%; Compositae 17%; Cruciferae 16%; Leguminosae 15%. Males (71): Compositae 80%; Rosaceae 10%. Total: 403 in 30 families, 69 genera as follows:

Alliaria 2♀; *Allionia* 11♀; *Althaea* 1♀, 1♂; *Amelanchier* 2♀; *Amorpha* 1♀; *Anaphalis* 1♀; *Angelica* 1♀; *Apocynum* 3♀; *Arctium* 1♀; *Asparagus* 1♀; *Aster* 6♀, 11♂; * *Barbarea* 37(11)♀; * *Brassica* 13(2)♀; *Camassia* 1♀; *Campanula* 2♀; *Capsella* 1♀; *Castanea* 1♀; *Ceanothus* 5♀; *Cichorium* 3♀; *Cirsium* 1♀; *Cornus* 2♀; *Crataegus* 1♀; *Daucus* 1♂; * *Echium* 5(3)♀; *Erigeron* 3♀; 2♂; *Eryngium* 1♀; *Eupatorium* 2♂; *Forsythia* 1♀; *Geranium* 3♀; *Helianthus* 2♀; 1♂; *Hieracium* 8♀; * *Houstonia* 2(2)♀; * *Hydrangea* 1(1)♀; *Hydrophyllum* 1♀; *Leontodon* 2♀; *Lonicera* 1♀; *Malva* 1♂; *Medicago* 3♀; 1♂; *Melilotus* 41♀, 2♂; * *Pastinaca* 1(1)♀; *Pentstemon* 1♀; *Philadelphus* 3♀; *Phlox* 1♀; *Physocarpus* 1♀; *Polemonium* 3♀; *Polygonum* 1♂; * *Potentilla* 19(13)♀; *Prunus* 6♀; *Pyrus* 10♀; 7♂; *Ranunculus* 2♀; * *Rhus* 13(5)♀; * *Rosa* 19(2)♀; * *Rubus* 15(5)♀; *Rudbeckia* 3♀, 3♂; *Salix* 9♀; *Saliva* 1♀; *Solidago* 15♀, 37♂; *Sonchus* 4♀, 1♂; *Sorbaria* 2♀; *Spirea* 5♀; * *Taraxacum* 6(1)♀; * *Trifolium* 6(1)♀; *Tussilago* 3♀; *Vaccinium* 4♀; *Veronica* 2♀; *Veronicastrum* 1♂; *Viburnum* 3♀; *Viola* 3♀; *Zizia* 2♀.

MITE ASSOCIATES.—Of the 1786 females examined, 1356 (76%) had hypopodes in their acarinaria. This is in general agreement with Eickwort's (1979) estimate that "85% of museum specimens bear anoetid hypopodes." Two hundred eighty-three (43%) of the 656 males examined carried hypopodes on their ventral surface, usually from the venter of the thorax to the front coxae and genae (rarely on the mandibles).

SPECIMENS EXAMINED.—2442 (1786♀, 656♂).

CANADA. MANITOBA: Glenboro. NEW BRUNSWICK: Albert Mines, 5 mi W, Fredericton, Kouchibouguac, Moore's Milles, Nerepis, St. Andrews, 15 mi N. NOVA SCOTIA: *Ann Co.:* Baddeck (Cape Breton Island); *Digby Co.; Hants Co.:* Kentville; *Kings Co.:* Smith's Cove. ONTARIO: *Carleton Co.; Dufferin Co.; Elgin Co.; Essex Co.; Frontenac Co.; Grenville Co.;*

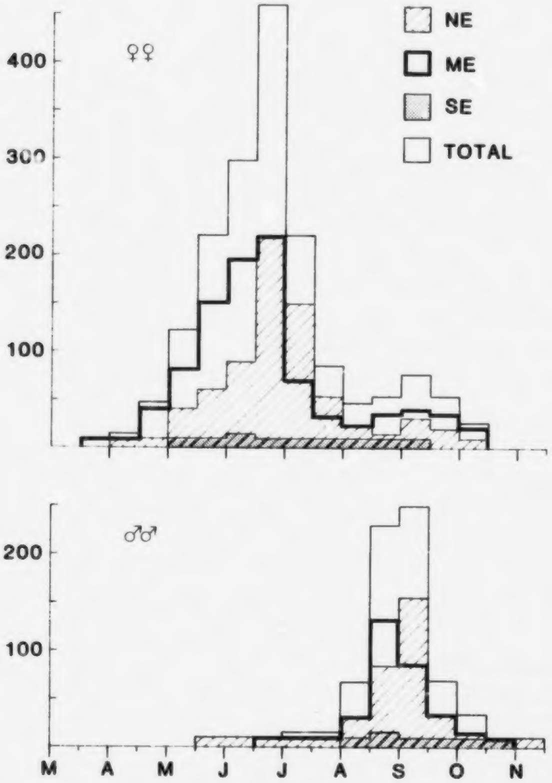


FIGURE 364.—*Lasioglossum coriaceum* flight records.

Haliburton Co.; Hastings Co.; Kent Co.; Lanark Co.; Leeds Co.; Middlesex Co.; Muskoka District: Severn Bridge; *Parry Sound District:* Callender; *Peterbourough Co.; Simcoe Co.; Sudbury District:* Peach Lake; *Renfrew Co.; York Co.* Quebec: Aylmer, Chelsea, Covey Hill, Ft. Coulonge, Harrington Lake, Hemmingford, Hull, Ile Perrot, Kirk's Ferry, LaTrappe, Montreal, St. Johns, Ste. Annes, Rupert.

UNITED STATES. Connecticut: *Fairfield Co.; Hartford Co.; Litchfield Co.; New London Co.; Tolland Co.* District of Columbia: Washington D.C. Florida: (?) no other data (1♂, USNM). Georgia: *Fannin Co.; Lumpkin Co.; Towns Co.:* Blue Mt., Rocky Mt.; *Union Co.:* Levelland Mt.; *White Co.:* Tray Mt. Illinois: *Champaign Co.; Coles Co.; Cook Co.; Jo Davies Co.; Kane Co.; Lake Co.; La Salle Co.; McDonough Co.; McHenry Co.; McLean Co.; Ogle Co.; Peoria Co.; Piatt Co.; Rock Island Co.; Vermilion Co.; Whiteside Co.; Will Co.; Woodford Co.* Indiana: *Clark Co.; Crawford Co.; Dearborn Co.; Gibson Co.; Harrison Co.; Howard Co.; Knox Co.; Kosciusko Co.; Parke Co.; Ripley Co.; Tippecanoe Co.; Warren Co.; Wayne Co.* Iowa: *Boone Co.; Dickinson Co.; Dubuque Co.; Fayette Co.; Fremont Co.; Iowa Co.; Page Co.; Story Co.; Webster Co.; Woodbury Co.; Wright Co.* Kansas: *Anderson Co.:* Garnett; *Douglas Co.; Marshall Co.:* Blue Rapids, Maryville; *Riley Co.:* Manhattan. Maine: *Aroostock Co.:* Washburn; *Cumberland Co.; Franklin Co.; Lincoln Co.; Oxford Co.; Penobscot Co.; Waldo Co.; Washington Co.:* Princeton; *York Co.*

Maryland: *Baltimore Co.; Prince Georges Co.; Montgomery Co.* Massachusetts: all counties except Hampden and Berkshire. Michigan: *Allegan Co.; Baraga Co.; Bay Co.; Berrien Co.; Branch Co.; Cheboygan Co.; Chippewa Co.; Clare Co.; Clinton Co.; Crawford Co.; Eaton Co.; Emmet Co.; Gladwin Co.; Gratiot Co.; Hillsdale Co.; Houghton Co.; Ingham Co.; Ionia Co.; Kalamazoo Co.; Kalkaska Co.; Lake Co.; Lenawee Co.; Livingston Co.; Mackinac Co.; Manistee Co.; Marquette Co.; Mecosta Co.; Midland Co.; Missaukee Co.; Monroe Co.; Oakland Co.; Presque Isle Co.; Roscommon Co.; Saginaw Co.; St. Joseph Co.; Schoolcraft Co.; Van Buren Co.; Washtenaw Co.; Wayne Co.* Minnesota: *Aitkin Co.; Anoka Co.; Becker Co.; Carlton Co.; Carver Co.; Chisago Co.; Clay Co.; Clearwater Co.; Dakota Co.; Fairbault Co.; Fillmore Co.; Freeborn Co.; Hennepin Co.; Houston Co.; Itasca Co.; Jackson Co.; Marshall Co.; Mille Lacs Co.; Murray Co.; Norman Co.; Olmsted Co.; Pine Co.; Pipestone Co.; Ramsey Co.; Rock Co.; St. Louis Co.; Stearns Co.; Steele Co.; Wabasha Co.; Wright Co.* Missouri: *Franklin Co.:* unspecified locality; *Pike Co.:* Louisiana. Nebraska: *Cuming Co.:* West Point; *Douglas Co.:* Omaha; *Lancaster Co.:* Lincoln; *Sioux Co.:* War Bonnet.

New Hampshire: all counties except Rockingham and Sullivan. New Jersey: *Bergen Co.; Morris Co.:* Lake Hopatcong; *Union Co.:* Plainfield. New York: *Albany Co.; Bronx Co.; Broome Co.; Cattaraugus Co.; Cayuga Co.; Columbia Co.; Dutchess Co.; Erie Co.; Essex Co.; Genesee Co.; Greene Co.; Herkimer Co.; Kings Co.; Madison Co.; Monroe Co.; Nassau Co.; Niagara Co.; Onondaga Co.; Ontario Co.; Orange Co.; Oswego Co.; Otsego Co.; Rensselaer Co.; St. Lawrence Co.; Saratoga Co.; Schoharie Co.; Schuyler Co.; Seneca Co.; Suffolk Co.; Sullivan Co.; Tioga Co.; Tompkins Co.; Ulster Co.; Warren Co.; Westchester Co.* North Carolina: *Buncombe Co.:* Black Mts.; *Graham Co.:* Robbinsville; *Haywood Co.:* Eagle's Nest Mt., N of Hazelwood; *Jackson Co.:* Willets; *Macon Co.:* Highlands, Van Hook Glade; *Swain Co.; Yancey Co.* North Dakota: *Cass Co.:* Fargo. Ohio: *Ashtabula Co.; Butler Co.; Champaign Co.; Clark Co.; Cuyahoga Co.; Delaware Co.; Fairfield Co.; Franklin Co.; Greene Co.; Hamilton Co.; Hocking Co.; Jackson Co.; Lawrence Co.; Lucas Co.; Miami Co.; Ottawa Co.; Portage Co.; Ross Co.; Scioto Co.; Stark Co.; Summit Co.; Vinton Co.* Pennsylvania: *Allegheny Co.; Beaver Co.; Butler Co.; Centre Co.; Crawford Co.; Cumberland Co.; Dauphin Co.; Delaware Co.; Erie Co.; Fayette Co.; Lehigh Co.; Northumberland Co.; Pike Co.; Union Co.; Westmoreland Co.; York Co.*

Rhode Island: *Washington Co.:* Davisville. South Dakota: *Pennington Co.:* Spring Creek Camp (11 mi NE Hill City). Tennessee: *Campbell Co.:* Caryville, 4 mi W; *Morgan Co.:* Morgan State Forest (4 mi N Petros); *Union Co.:* LaFolette, 11 mi SE. Vermont: *Addison Co.; Bennington Co.; Chittenden Co.; Franklin Co.; Windham Co.; Windsor Co.* Virginia: *Arlington Co.; Bedford Co.:* Flat Top Mt.; *Clarke Co.:* Shenandoah River at Berrys; *Fairfax Co.; Giles Co.:* Mt. Lake Biological Station; *Montgomery Co.; Prince Edward Co.:* Farmville. West Virginia: *Brooke Co.:* Chester; *Hardy Co.:* Lost River State Park; *Raleigh Co.:* unspecified locality; *Tucker Co.:* Davis, Parsons; *Wyoming Co.:* Baileysville. Wisconsin: *Bayfield Co.; Burnett Co.; Clark Co.; Columbia Co.; Dane Co.; Dodge Co.; Door Co.; Douglas Co.; Dunn Co.; Fond du Lac Co.; Grant Co.; Jefferson Co.; Manitowoc Co.; Marathon Co.; Milwaukee Co.; Pierce Co.; Polk Co.; Racine Co.; Rock Co.; St. Croix Co.; Sauk Co.; Shawano Co.; Trempealeau Co.; Vernon Co.; Waukesha Co.; Waupaca Co.; Waushara Co.; Winnebago Co.*

14. *Lasioglossum costale* (Vachal)

Figures 28, 365–371

Halictus costalis Vachal, 1904:475 [female].—Cockerell, 1905a:90 [key].

Halictus matensis Friese, 1916:303 [female]. [New Synonymy.]

Lasioglossum costale.—Moure and Hurd, 1986:60 [catalog].

Type Material.—Vachal based his description of *Halictus costalis* on four syntypic females deposited in the Paris Museum (MNHNP). Moure and Hurd (1986) state that "one of the females of the original type series (collection Sichel) was labeled by one of us (Moure) in April, 1958 as the lectoholotype and is now so designated." This specimen now lacks the lectoholotype label mentioned above and instead has a large red "HOLOTYPE" label. In order to avoid additional confusion I have reattached a lectotype label with the designation attributed to Moure. The lectotype is in good condition, missing only the last two tarsomeres of the left hind leg and most of the mesoscutal hairs. It is labeled

MUSEUM PARIS Mexique [handwritten] COLL. O. SICHEL 1867/HOLOTYPE [handwritten on red label]/costalis ♀ Vach.[al] [handwritten by Vachal?]/Halictus costalis Vach. [handwritten]/LECTOTYPE Halictus costalis Vachal des.[ignated by] Moure [red label; labeled by McGinley, 1984].

I have attached yellow "PARALECTOTYPE" labels to the three remaining females in Vachal's original series.

Friese based his description of *H. matensis* on two females from San Mateo, Costa Rica. The one specimen available for study is herein designated the lectotype; it is labeled

Costa Rica San Mateo 1904/Halictus matensis ♀ 1915 Friese Fr. det./Typus [square orange label]/Zool. Mus. Berlin/LECTOTYPE Halictus matensis des.[ignated by] McGinley.

The lectotype is missing the left antenna but otherwise is in excellent condition. It is deposited in the Museum für Naturkunde der Humboldt-Universität zu Berlin.

DISTRIBUTION (Figure 365).—*Lasioglossum costale* has been collected from Costa Rica, Guatemala, Honduras, and the Mexican states of Michoacan, Veracruz, and Chiapas. Only 22 females and 6 males are currently known.

DIAGNOSIS.—The combination of the entirely granuloso-punctate mesoscutum (similar to Figure 649; not coarse as in *L. cercothrix*, Figure 313), ruguloso-striolate dorsal propodeal surface (as in Figure 1), the absence of a metasomal acarinarium and the lack of conspicuous infuscation along the anterior edge of the forewing will distinguish the females of *L. transvorsum, L. costale, L. manitouellum, L. asaphes,* and *L. xyriotropis* from those of other New World *Lasioglossum. Lasioglossum transvorsum* is easily recognized by the elevated, V-shaped propodeal rim (Figure 650) and the distinctive, adpressed hair patches on the anterior surface of tergum I (Figure 651). The pronotal lateral carina of *L. asaphes* and *L. xyriotropis* is complete (Figures

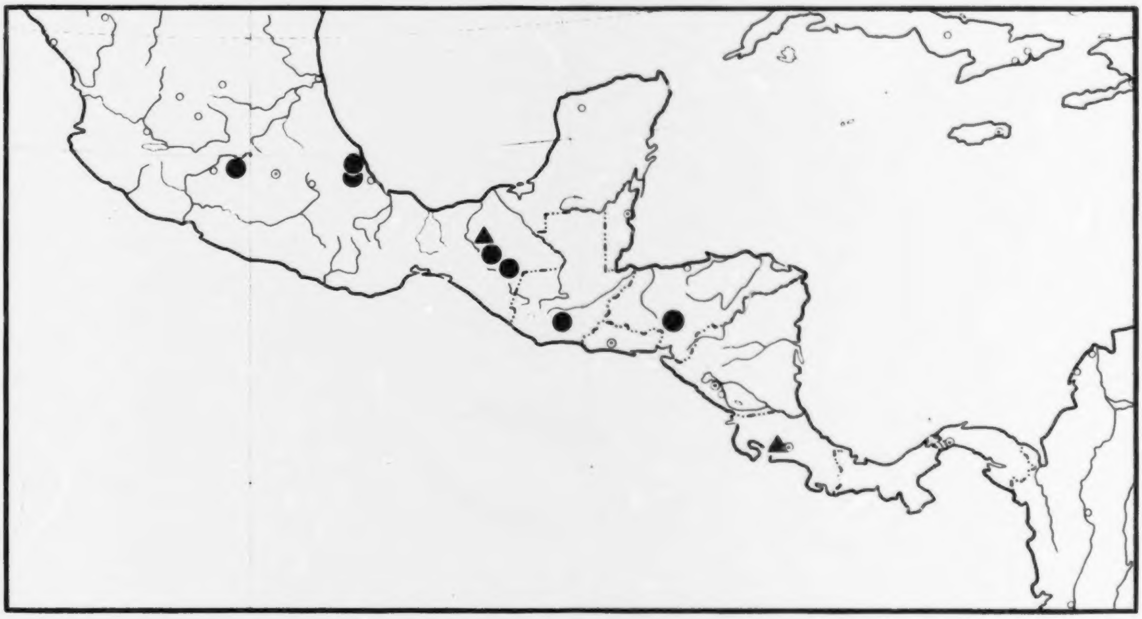


FIGURE 365.—Distribution of *Lasioglossum costale*, light form (circle) and dark form (triangle).

280, 732), whereas that of *L. costale* and *L. manitouellum* is distinctly interrupted by a lateral sulcus. This interruption is broad and conspicuous in *L. costale* (Figure 281) versus narrow yet distinct in *L. manitouellum*. The latter species has hyaline forewing membranes with lightly infuscated apices (Figure 152), whereas the wings of *L. costale* are pale orange throughout.

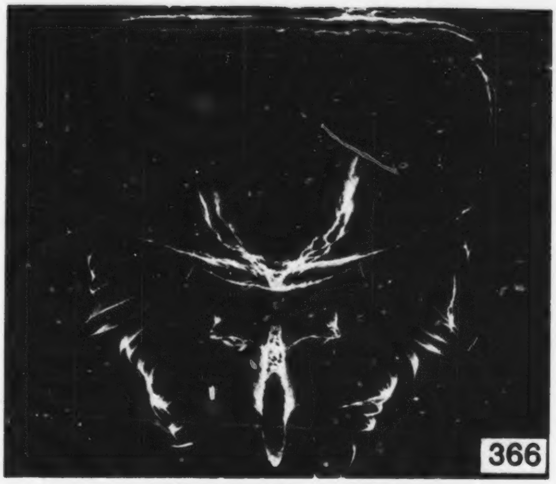
Most females of *L. costale* have pale yellowish brown mesoscutal pubescence and distinctive pale yellowish orange hind tibiae. However, three females, including both types, have dark brown mesoscutal hairs and dark brown tibiae (see "Remarks" section).

The males of *L. costale* can be recognized by the vestiture of sternum V, which is characterized by a dense rosette of short hairs on the posterior edge that expands into lateral lobes of relatively long hairs (Figure 371).

DESCRIPTION.—FEMALE: (1) Length 7.8–9.3 mm ($\bar{x}$ = 8.6, n = 13); (2) wing length 2.3–2.6 mm ($\bar{x}$ = 2.5, n = 13); (3) abdominal width 2.3–2.9 mm ($\bar{x}$ = 2.7, n = 13).

Structure: (4) Head short (similar to Figure 303); length/width ratio 0.83–0.92, $\bar{x}$ = 0.89, n = 13. (7) Supraclypeal area slightly narrowly rounded, (8) moderately protuberant. (9) Clypeus projecting approximately 0.85 of its length below lower margin of eyes; (11) surface apparently without median longitudinal sulcation. (14) Distance between lateral ocelli subequal to distance between lateral ocellus and eye. (23) Flagellomere 1 subequal to 2 in length along dorsal surface. Labrum as in Figure 366; (27) distal keel moderately narrow in frontal view, nearly parallel-sided; (28) distal lateral projections somewhat small but distinct, triangular; (29) fimbrial setae acutely pointed.

(32) Pronotal lateral angle narrowly obtuse, pointed; (33) pronotal lateral ridge incomplete, interrupted by oblique lateral sulcus; (34) lower portion of lateral ridge narrowly rounded. (35) Mesoscutal lip weakly bilobed, (36) moderately elevated from pronotum. (40) Dorsal surface of propodeum about 0.84 the length of scutellum and about 1.6 times the length of metanotum, (41) depressed centrally, (42) posterior margin broadly rounded; (43) propodeal triangle weakly defined, evident medially as a low V-shaped elevation, lateral rims absent; (44) lateral carinae extending approximately one-third the length of posterior surface. (45) Tibial spur as in Figure 28.



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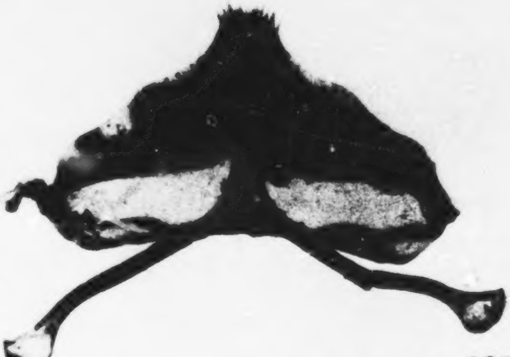

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FIGURES 366, 367.—*Lasioglossum costale:* 366, female labrum; 367, male sterna VII–VIII.

(46) Lateral edge of metasomal tergum II very weakly sinuate.

Sculpture: (47) Face shiny, (48) densely and uniformly punctate between ocelli and antennae, punctures contiguous. (51) Supraclypeal area strigulate; (52) obscurely and sparsely punctate, punctures separated by 1–5 times their width. (53) Clypeus granulate basally, apical two-thirds moderately polished; (54) punctures obscure basally, large and elongated apically, separated by their width or less. (56) Mesoscutum moderately shiny; (57) punctation as in Figure 649, punctures extremely dense, contiguous throughout, becoming granuloso-punctate anteriorly. (58) Scutellum granuloso-punctate posteriorly, punctures less dense and larger anteriorly adjacent to median line, separated by 1–2 times their width. (63) Dorsal surface of propodeum completely ruguloso-striolate (similar to Figure 1); (64) surface alveolated. (65) Metasomal tergum I moderately shiny; (66) punctation fine, extremely dense, punctures nearly contiguous.

Coloration: (71) Wing membrane deep yellowish orange, becoming infuscated apically.

Vestiture: (74) Pubescence of head yellowish brown near antennae, becoming gold-brown on vertex (brown on vertex in three females). (75) Pubescence of thorax mostly pale yellowish brown, white on pronotal lateral angle and pronotal lobe (mesoscutal hairs brown in three females); (76) mesoscutal hairs moderately dense and plumose. (77) Hind tibial hair color differentiated, ventral hairs golden, dorsal hairs brown (hairs mostly dark brown in three females). (78) Anterior hairs of metasomal tergum I pale yellowish brown, (79) basal hair bands of terga II–IV white. (80) Acarinarium absent, elongate hairs scattered over anterior surface of tergum I.

MALE: Similar to female except as follows: (1) length 6.4–8.0 mm ($\bar{x} = 7.2$, $n = 3$); (2) wing length 2.0–2.2 mm ($\bar{x} = 2.1$, $n = 3$); (3) abdominal width 1.8–2.1 mm ($\bar{x} = 2.0$, $n = 3$). (4) Head moderately elongate (length/width ratio 0.91–0.95, $\bar{x} = 0.92$, $n = 3$). (5) Gena subequal to eye in width, (6) moderately produced posteriorly. (10) Clypeal surface shallowly depressed ventrally. (24) Labral distal process absent; (25) basal area depressed medially; (26) basal lateral depressions weakly developed. (30) Mandible short, just reaching opposing clypeal angle. (53) Clypeus granulate basally, apical two-thirds polished; (54) punctures well formed, nearly contiguous basally, very fine and scattered over apical two-thirds. (68) Clypeal maculation present. (69) Flagellum entirely dark. (72) Tarsi dark, concolorous with tibiae.

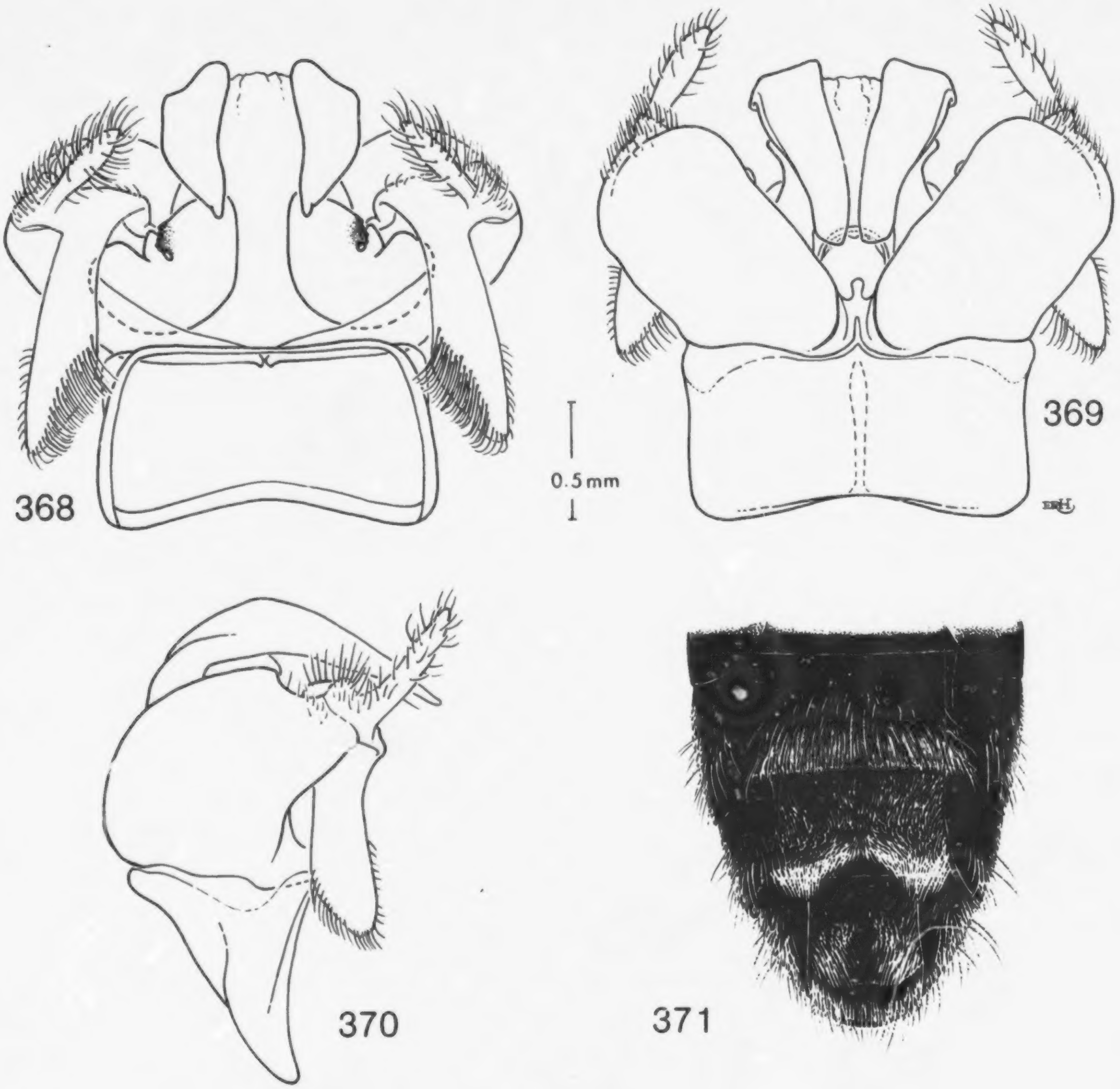
Vestiture: Sternal vestiture as in Figure 371; (82) hairs on sternum IV moderately short, suberect to erect; (83) hairs on sternum V very short, suberect, posterior edge of sternum with median rosette of short, dense hairs that expand laterally into moderately elongate hair lobes.

Terminalia: Sterna VII–VIII as in Figure 367; (85) sternum VIII with short, broadly rounded median process. Genitalia as in Figures 368–370; (86) gonobase moderately elongate; (87) gonostylus extremely elongate and slender; (89) retrorse membranous lobe moderately broad with characteristic hair patch along apical margin; (90) volsella with prominent lateral lobe.

FLIGHT RECORDS.—*Lasioglossum costale* females have been collected in every month except January, August, and November. The six known males have been taken from early March through May.

FLOWER RECORDS.—One pollen-laden female taken from *Bidens pilosa* (Compositae) in Michoacan, Mexico.

REMARKS.—The lectotype females of both *Halictus costalis* Vachal and *H. matensis* Friese have dark brown mesoscutal hairs and dark brown hind tibiae. Only one other "dark form" female from Simojovel, Chiapas, is known. Vachal's syntype series of four females included two with pale yellowish brown mesoscutal pubescence and yellowish orange hind tibiae that were labeled "H.[alictus] costalis var.[iety]." In his original description Vachal lists these specimens as representing a variety of *H. costalis* with "translucent posterior tibiae." It is this "light form" of *Lasioglossum costale* that has been most commonly collected. Considerable variation exists in the pigmentation of hind tibiae; in fact, one of the females Vachal grouped with the one "dark form" female in his series actually has light brown tibiae and pale yellowish brown mesoscutal pubescence characteristic of the "light form."



FIGURES 368–371.—*Lasioglossum costale*, male: 368, genitalia, ventral view; 369, same, dorsal view; 370, same, lateral view; 371, sternal vestiture.

Nevertheless, the possibility exists that these two forms represent distinct species, but aside from the color differences mentioned above, the only detected morphological difference is that the posterior margin of the dorsal propodeal surface is more sharply edged in the "dark form" females. Furthermore, one male collected on 18 Mar 1953, in the vicinity of a "dark form" female taken on 19 Mar 1953 near Simojovel, Chiapas, appears to be identical with other males associated with "light form" females.

Vachal ended his treatment of *Halictus costalis* by indicating that the species (or possibly just the "light form" females) may prove to be conspecific with *H. politus* Smith, 1879 (preoccupied by *politus* Schenck, 1853) (= *H. schenckii* (Ritsema)). Type material of *H. schenckii* or presumed conspecific specimens could not be located for study. Smith's description is very generalized but he does mention that the wings of *H. schenckii* are pale fulvo-hyaline, and Cockerell (1898c, 1905b) states that the wings are "strongly yellowish." This sounds similar to the condition found in *L. costale* but cannot be determined in the absence of type material. *Lasioglossum schenckii*, herein treated as a nomen dubium, would have priority if shown to be conspecific with *L. costale*.

SPECIMENS EXAMINED.—28 (22♀, 6♂).

COSTA RICA. San Mateo, 1904 (dark form ♀, *Halictus matensis* lectotype: Berlin).

GUATEMALA. Antigua, Oct 1965, N.L.H. Krauss (1♀; NMNH).

HONDURAS. Uyaca Peak, 9 Feb, Cockerell (3♀; NMNH).

MEXICO. CHIAPAS: Comitan, 13 mi E, 3 Mar 1953, R.C. Bechtel, E.I. Schlinger (2♀, 2♂; UCB); Ixtapa, 9 mi S, 1 Apr 1953, R.C. Bechtel, E.I. Schlinger (1♀, 1♂; UCB); Navenchauc, 8 mi W, 1 Apr 1953, R.C. Bechtel, E.I. Schlinger (1♂; UCB); Rayon, 7 mi W, 17 May 1976, J.R. Powers (1♂; UCB); San Cristobal de las Casas, 26 Apr, 2 May 1959, H.E. Evans (2♀; CU), 8 mi SE, 19 Jul 1956, J.W. MacSwain (1♀; UCB), 9 mi E, 29 Jul 1957, J.A. Chemsak, B.J. Rannells (1♀; UCB); Simojovel, 4 mi S, 18–19 Mar 1953, R.C. Bechtel, E.I. Schlinger (1 dark form ♀, 1♂; UCB). MICHOACAN: Tuxpan, 7.1 km W, 22 Sep 1976, on *Bidens pilosa* Linne, 1768 m, C.D. George, R.R. Snelling (1♀; NMNH). VERACRUZ: Ciudad Mendoza, 19 km NW, 11 Jul 1974, J.A. Chemsak, E. & J. Linsley, J. Powell (2♀; UCB); Jalapa, 3 Jun 1965 (1♀; NMNH); Orizaba, 10 mi W, 31 Dec 1940, G.E. Bohart (1♀; CAS); Orizaba, 1862, Biart (3 paralectotype ♀; MNHNP). UNSPECIFIED LOCALITY (dark form ♀, lectotype of *Halictus costalis*).

15. *Lasioglossum crocoturum* (Vachal), new combination

FIGURES 1, 29, 372–380

Halictus crocoturus Vachal, 1904:473 [female, male].—Cockerell, 1905a:90 [key].
Halictus sericeus Friese, 1916:304 [female]. [New synonymy.]

TYPE MATERIAL.—Vachal did not designate a holotype for *Halictus crocoturus;* his description was based on two females and one male. The one syntypic female available for study is herein designated the lectotype. It is labeled

Museum Paris, MEXIQUE, Coll. O. Sichel 1867/Mex[ico], [illegible word, presumably the collector name], [18]67 [handwritten]/HOLOTYPE [handwritten on red label]/crocoturus Vach[al] ♀ [handwritten]/Halictus crocoturus Vach.[al] [handwritten]/LECTOTYPE Halictus crocoturus Vachal des.[ignated by] McGinley.

The lectotype is in good condition but has many hairs on the head and thorax matted, an old pin-hole on the left side of the propodeum and has evidence of old mold growth on the antennae. The lectotype, male paralectotypes and presumably the female paralectotype are deposited in the Paris Museum (MNHNP).

The female holotype of *H. sericeus* could not be located for study. See "Remarks" section for explanation of synonymy.

DISTRIBUTION (Figure 372).—*Lasioglossum crocoturum* is known from only 10 females and five males ranging from the Mexican states of Nayarit, Michoacan, and Oaxaca, south to Guatemala, El Salvador, and Panama.

DIAGNOSIS.—Females and males of *L. crocoturum* can be distinguished from all other known *Lasioglossum* by the following combination: tergum IV nearly entirely covered by short, pale, adpressed pubescence (Figure 1; not the usual basal hair band) and the anterior edge of the forewing, including the marginal cell, conspicuously infuscated (Figure 1). Tergum III of *L. crocoturum* females is unique in having two transverse bands of pale, adpressed pubescence (Figure 1). Other characters helpful in recognizing *L. crocoturum* are the finely granuloso-punctate mesoscutum and the dense, conspicuous hair patches covering the pronotal lateral angle (Figure 1).

Other species having tergum IV covered by adpressed pubescence are *L. tropidonotum* and *L. cercothrix*. The former has a distinctive median longitudinal ridge on the mesoscutum (Figure 174) and lacks an infuscated wing pattern. *Lasioglossum cercothrix* has only the apex of the forewing infuscated (the marginal cell is hyaline). Furthermore, *L. cercothrix* has a coarsely punc-

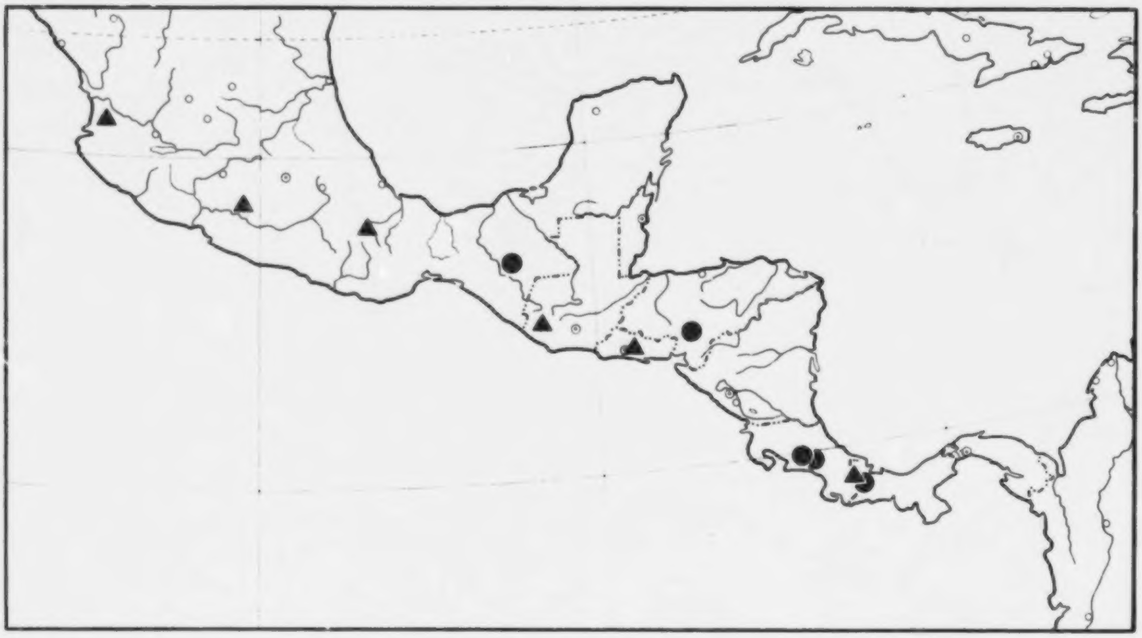


FIGURE 372.—Distribution of *Lasioglossum crocoturum* (triangle) and *L. uyacicola* (circle).

tate mesoscutum (Figure 313; finely granulosopunctate in *L. crocoturum*, Figure 1) and has a short head (Figure 310, length/width ratio 0.85–0.92; elongate in *L. crocoturum*, length/width ratio 0.88–0.96). *Lasioglossum sandrae* also has tergum IV covered by short, adpressed pubescence but is a much larger bee (body length 9.8–11.1, vs. 7.8–9.6) and has the mesoscutum conspicuously covered by short, suberect pubescence (mesoscutal hair elongate, erect in *L. crocoturum*).

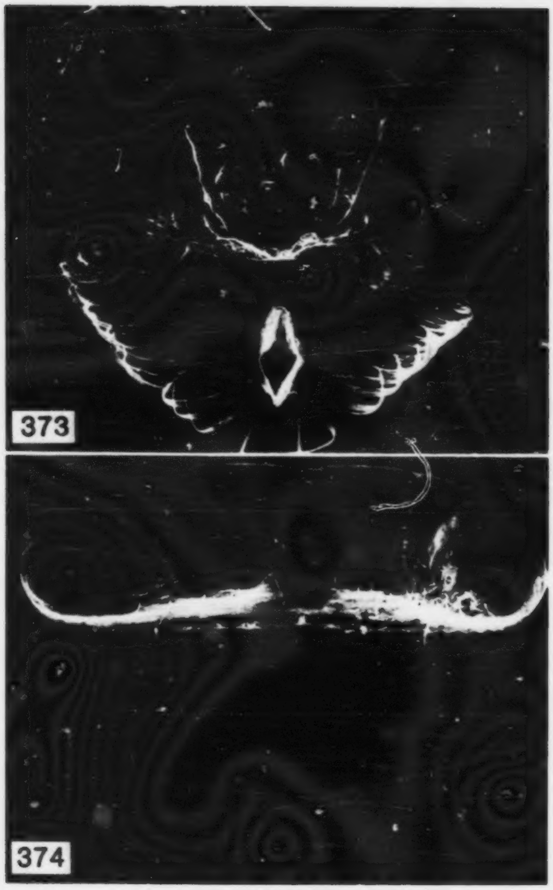
DESCRIPTION.—FEMALE: (1) Length 7.8–9.6 mm ($\bar{x}$ = 7.5, n = 7); (2) wing length 2.4–2.7 mm ($\bar{x}$ = 2.6, n = 7); (3) abdominal width 2.4–3.0 mm ($\bar{x}$ = 2.8, n = 7).

Structure: (4) Head elongate; length/width ratio 0.88–0.96, $\bar{x}$ = 0.92, n = 7. (7) Supraclypeal area evenly rounded, (8) moderately protuberant. (9) Clypeus projecting approximately 0.82 of its length below lower margin of eyes; (11) surface without median longitudinal sulcation. (14) Distance between lateral ocelli slightly exceeded by distance between lateral ocellus and eye. (23) Flagellomere 1 subequal in length to 2 along dorsal surface. Labrum as in Figure 373; (27) distal keel moderately broad, short; (28) distal lateral projections very well developed, conspicuously broad, rounded; (29) fimbrial setae acutely pointed.

(32) Pronotal lateral angle broadly obtuse; (33) pronotal lateral ridge incomplete, narrowly interrupted by oblique lateral sulcus; (34) lower portion of lateral ridge narrowly rounded to sharply edged. (35) Mesoscutal lip weakly bilobed, (36) moderately elevated from pronotum. (40) Dorsal surface of propodeum about 0.65 the length of scutellum and about 1.1 times the length of metanotum, (41) slightly depressed centrally, (42) posterior margin broadly rounded; (43) propodeal triangle very weakly defined laterally, evident medially by low, rounded V-shaped elevation without lateral rims; (44) lateral carinae extending approximately three-fourths the length of the posterior surface, nearly reaching the dorsal propodeal surface. (45) Tibial spur as in Figure 29.

(46) Lateral edge of metasomal tergum II very weakly sinuate.

Sculpture: (47) Face moderately shiny, (48)



FIGURES 373, 374.—*Lasioglossum crocoturum* labra: 373, female; 374, male.

densely and nearly uniformly punctate between ocelli and antennae, punctures contiguous and only slightly larger near antennae. (51) Supraclypeal area extremely granulate; (52) punctures separated by their width or less. (53) Clypeus granulate basally, apical half polished; (54) punctures separated by less than their width basally, less dense and larger on apical half. (56) Mesoscutum moderately shiny; (57) punctation as in Figure 1, punctures extremely dense, finely granuloso-punctate throughout. (58) Scutellum nearly uniformly granuloso-punctate, some punctures slightly separated near center. (63) Dorsal surface of propodeum (Figure 1) ruguloso-striolate; (64) surface alveolated. (65) Metasomal tergum I moderately shiny; (66) granuloso-punctate throughout.

Coloration: (70) Posterior two-thirds of wing membrane mostly hyaline, anterior one-third along costal margin, including marginal cell, strongly infuscated.

Vestiture: (74) Pubescence of head golden (pale yellowish brown in specimens from Michoacan). (75) Pubescence of mesoscutum golden, hairs on pronotal lateral angle and metanotum yellowish white (specimens from Michoacan with mesoscutal hairs pale yellowish brown, pronotal and metanotal hairs white); hairs on pronotal lateral angle thick, conspicuous; (76) mesoscutal hairs moderately dense and plumose. (77) Hind tibial hair color differentiated, most hairs white, dorsal hairs light brown to brown. (78) Anterior hairs of metasomal tergum I white; (78) hair bands of terga II–IV yellowish white (white in specimens from Michoacan). (80) Acarinarium absent, elongate hairs scattered over anterior surface of tergum I. (80) Tergum III with two transverse, adpressed hair bands; tergum IV–V entirely covered by short, adpressed pubescence (Figure 1).

MALE: Similar to female except as follows: (1) length 7.2–8.5 mm ($\bar{x}$ = 8.0, n = 3); (2) wing length 2.1–2.3 mm ($\bar{x}$ = 2.2, n = 3); (3) abdominal width 1.9–2.0 ($\bar{x}$ = 2.0, n = 3). (4) Head elongate (length/width ratio 0.95–0.96, $\bar{x}$ = 0.96, n = 3). (5) Gena slightly wider than eye, (6) well produced posteriorly. (10) Clypeal surface flat, only faintly depressed near apical margin. Labrum as in Figure 374; (24) distal process absent; (25) basal area depressed medially; (26) basal lateral depressions faint to well developed. (30) Mandible short, just reaching opposing clypeal angle. (53) Clypeus weakly granulate basally, apical two-thirds polished; (54) punctures well formed, nearly contiguous basally, very fine and scattered over apical two-thirds. (68) Clypeal maculation present. (69) Flagellum entirely dark. (72) Tarsi dark, concolorous with tibiae.

Vestiture: Sternal vestiture as in Figure 375; (82) hairs on sternum IV moderately short and

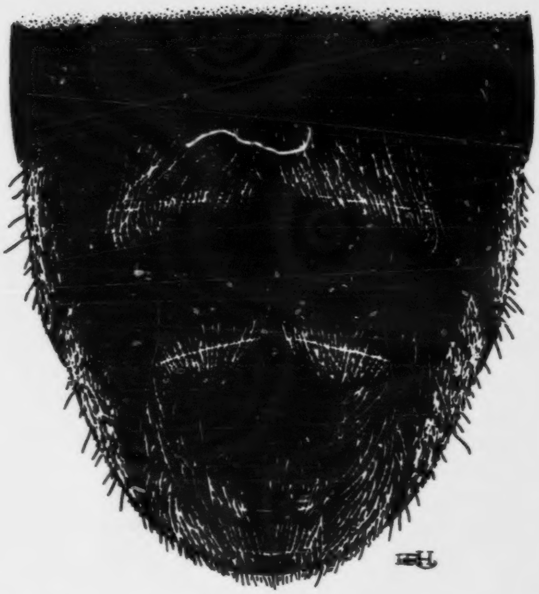


FIGURE 375.—*Lasioglossum crocoturum*, male sternal vestiture.

suberect to erect medially, becoming noticeably longer and erect laterally; (83) sternum V without conspicuous erect hairs, posterior edge of sternum with broadly rounded, adpressed hair lobes.

Terminalia: Sterna VII–VIII as in Figure 380; (85) sternum VIII with short, broad, apically rounded median process. Genitalia as in Figures 376–379; (86) gonobase moderately elongate; (87) gonostylus broad basally, tapering to narrowly rounded apex; (89) retrorse membranous lobe enormously broad; (90) volsella with prominent lateral lobe.

FLIGHT RECORDS.—Females of *L. crocoturum* have been collected in February, March, late May, and late September. All known male records are from March.

REMARKS.—I have not seen the type of *Halictus sericeus* Friese (it could not be found in the Berlin Museum (ZMHU) where it presumably was deposited). In his original description, Friese mentions that the third tergum of *H. sericeus* has two transverse bands of short, adpressed hairs and that the fourth tergum is entirely covered by similar pubescence. He also notes the infuscated anterior margin of the forewing. This character combination is unique to *L. crocoturum* (Vachal), and I therefore feel confident in synonymizing both names. Furthermore, I have a specimen before me from Guatemala identified as *H. sericeus* (apparently identified by Cockerell) that is clearly conspecific with the type of *H. crocoturus.*

Hair coloration is highly variable among specimens of *L. crocoturum*. Most specimens of *L. crocoturum* (including the lectotype) have generally golden pubescence with the hairs on the pronotal lateral angles, metanotum, and abdominal terga distinctly yellowish white. All of the specimens examined from Michoacan, Mexico, have conspicuously white pubescence. This variation is possibly clinal with paler forms occurring in the northern portion of the species range; however, because of the paucity of material this cannot presently be determined.

SPECIMENS EXAMINED.—14 (9♀, 5♂).

EL SALVADOR. Parque Nacional del Cerro Verde, 5 Jul 1963, 6800 ft, Scullen, Bolinger (1♀; OrS).

GUATEMALA. Pochuta, Feb–Mar 1931, 1000 m, J. Bequaert (1♀; USU).

MEXICO. MICHOACAN: Huetamo, Highway 15, 7 Mar 1972, F. Parker, D. Miller (4♀, 3♂; USU). NAYARIT: Santa Isabella, 9 mi NW, 10 Mar 1972, F. Parker, D. Miller (1♂; USU). OAXACA: Guelatao, 22 km NE, 18 Sep 1976, 2758 m, C.D. George, R.R. Snelling (1♀; LACM). UNSPECIFIED LOCALITY (1♀ lectotype, 1♂ paralectotype; MNHNP).

PANAMA. CHIRIQUI: Boquete, 20 May 1962, H. Ruckes (1♀; AMNH).

16. *Lasioglossum desertum* (Smith)

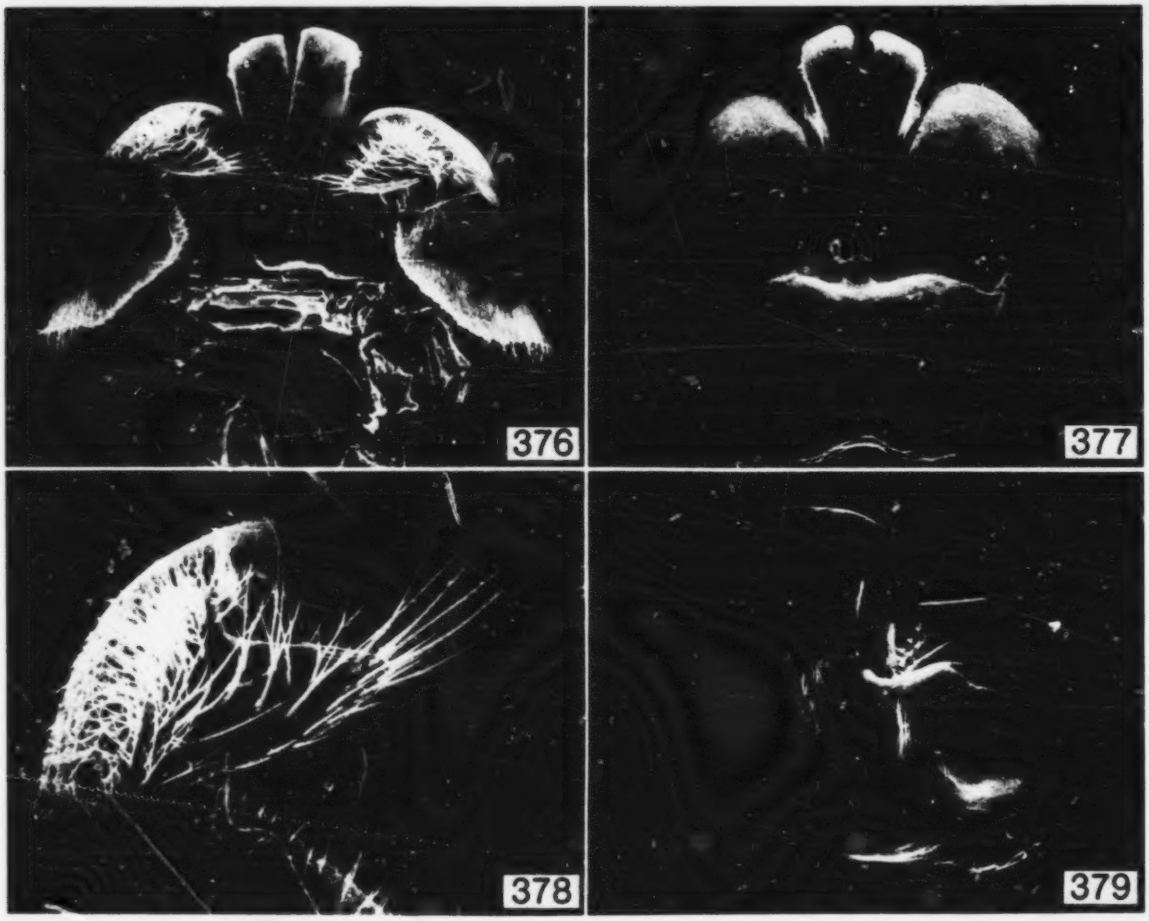
FIGURES 30, 302, 381–394

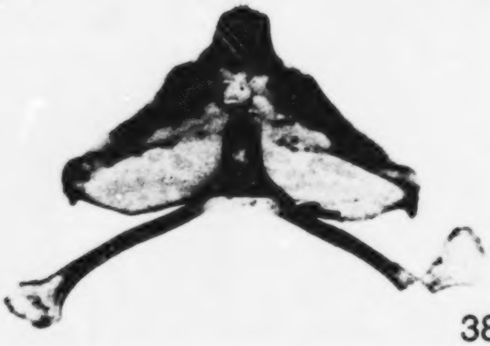
Halictus desertus Smith, 1879:38 [female, male].—Fox, 1893:14 [locality record: Baja California?].—Dalla Torre, 1896:60 [World catalog].—Cockerell, 1897:164 [taxonomic notes]; 1899:5 [locality record]; 1905b:353 [taxonomic notes].—Sandhouse and Cockerell, 1924:333 [distribution].—Cockerell, 1949:446 [taxonomic notes].

Halictus dersertus.—Dalla Torre, 1896:60 [lapsus calami].

Halictus cyaneiceps Cockerell, 1916a:254 [female, male]; 1930:6 [relationship to *H. heterorhinus*]. [New synonymy.]

Lasioglossum cyaneiceps.—Michener, 1951:1106 [Nearctic





FIGURES 376–380.—*Lasioglossum crocoturum*, male: 376, genitalia, ventral view; 377, same, dorsal view; 378, gonostylus; 379, volsella; 380, sterna VII–VIII.

catalog].—Hurd, 1979:1957 [Nearctic catalog].

Lasioglossum desertum.—Michener, 1954:40 [compared to *L. uyacicola*].

TYPE MATERIAL.—Smith based his original description of *Halictus desertus* on a female and male from Oajaca (sic), Mexico. The female lectotype, herein designated, is in poor condition. The hairs on and around the scutellum are soiled and the specimen is missing the following parts: the left antenna; tarsus and tibia of the left foreleg; distal tarsomere of the right foreleg; two distal tarsomeres of the left middle leg; tarsus and femur of the left hind leg; tarsus of the right hind leg. The lectotype, in the British Museum (BMNH), is labeled

Type H.T. [circular label with orange border]/B.M. TYPE HYM. 17.a.1012/Halictus desertus (Type) Sm. [handwritten]/LECTOTYPE Halictus desertus Smith des.[ignated by] McGinley.

The female holotype of *Halictus cyaneiceps,* in the National Museum of Natural History, Smithsonian Institution, is in excellent condition except for missing the last tarsomere of the left hind leg. It is labeled

Coll.[ector] Townsend/White Mts[Mountains] 7[Jul] 31 NM[New Mexico]/Rio Ruidoso [Lincoln County] Abt[about] 6500ft/On fls[flowers of] Heliopsis scabra/Type No. 20407 U.S.N.M.[red label]/Halictus cyaneiceps Ckll.[Cockerell] ♀ TYPE [handwritten by Cockerell].

Four female paratypes have been located: two in the National Museum of Natural History, one in the Canadian National Collection, and one in the University of California, Berkeley.

DISTRIBUTION (Figure 302).—*Lasioglossum desertum* occurs throughout the Rocky Mountain system as far north as Musselshell County, Montana, south to the state of Oaxaca, Mexico. Most specimens, however, have been collected in Arizona, Colorado, and New Mexico. Label data often includes elevation information with figures ranging from 5400 to 8750 feet. One male, possibly mislabeled, was collected from Murray County, Oklahoma (University of Kansas Collection).

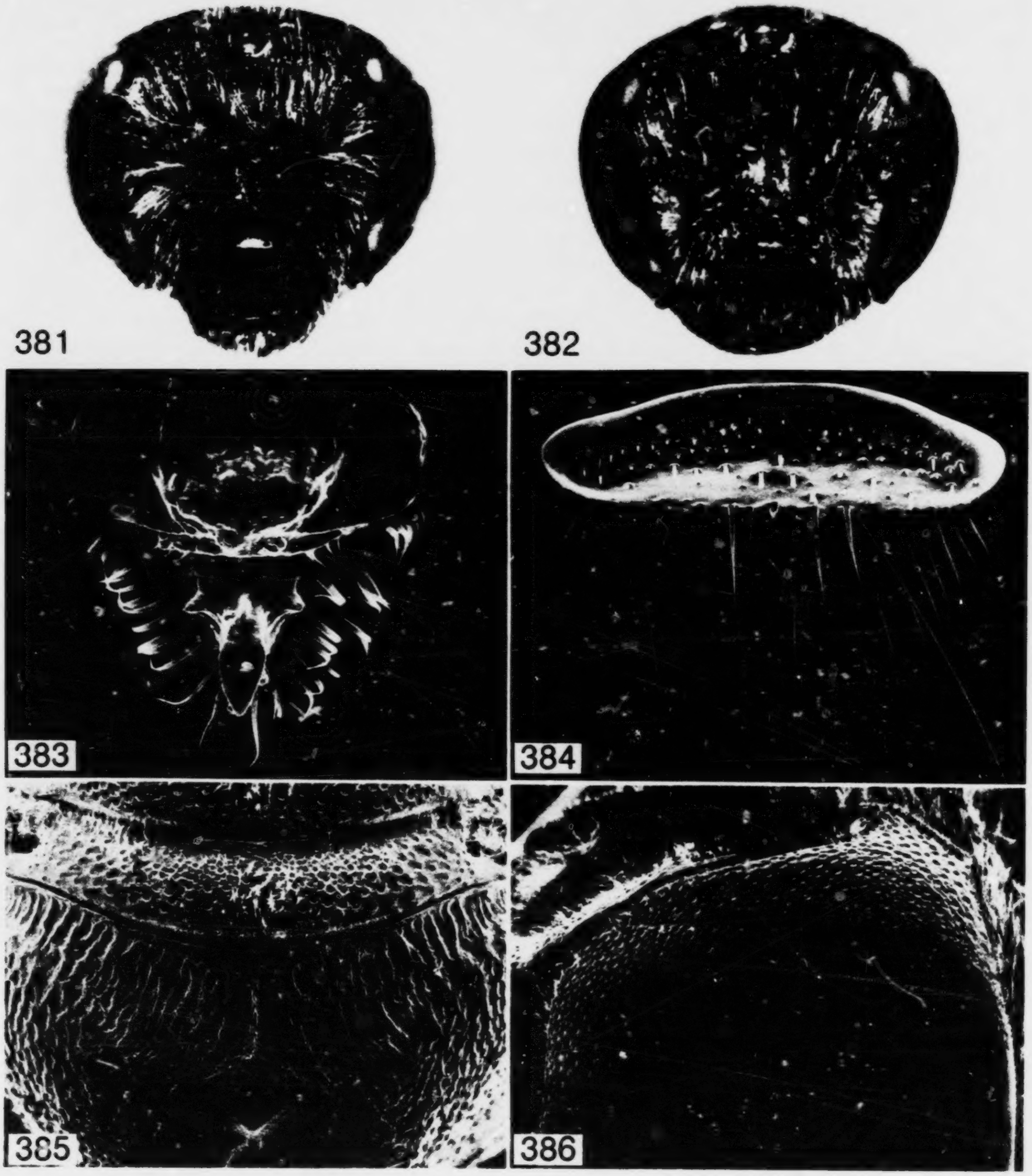
DIAGNOSIS.—The short head (Figure 381; length/width ratio 0.78–0.92, $\bar{x} = 0.86$), hyaline wing membranes and presence of an acarinarium on the anterior surface of metasomal tergum I (Figure 393) will separate female *L. desertum* from other *Lasioglossum* species except *L. bardum* and *L. jubatum*. *Lasioglossum jubatum* also has an extremely wide dorsal acarinarial opening (Figure 478), which differs from the relatively narrow opening found in *L. bardum* (Figure 307). *Lasioglossum jubatum* can be easily recognized by the deep golden to pale ferrugineous mesoscutal pubescence (white in *L. desertum*). *Lasioglossum acarophilum* (from Mexico and southern Arizona) and *L. uyacicola* (from Chiapas, Mexico to Panama) also have very wide dorsal acarinarial openings but have relatively elongate heads (Figures 246, 724) and mesoscuta that are completely granuloso-punctate and doubly-punctate (Figures 251, 727), differing from the relatively sparse punctation on the posterior half of the *L. desertum* mesoscutum (Figure 386).

Males of *L. desertum,* like those of L. *heterorhinum* and *L. lampronotum,* have conspicuously broad heads (Figures 382, 459, 487). The latter two species have complete pronotal lateral carinae, whereas that of *L. desertum* is distinctly interrupted. The hair lobes on the posterior edge of sternum V are only narrowly separated medially (Figure 387; compare with those of *L. heterorhinum,* Figure 464). Furthermore, the gonostyli of *L. heterorhinum* and *L. lampronotum* are only moderately elongate (Figure 468) differing from the conspicuously elongate gonostylus of *L. desertum* (Figure 391).

DESCRIPTION.—FEMALE: (1) Length 7.4–9.9 mm ($\bar{x} = 8.6$, n = 20); (2) wing length 2.3–2.6 mm ($\bar{x} = 2.5$, n = 20); (3) abdominal width 1.8–2.9 mm ($\bar{x} = 2.6$, n = 20).

Structure: (4) Head short (Figure 381; length/width ratio 0.78–0.92, $\bar{x} = 0.86$, n = 20). (7) Supraclypeal area evenly rounded, (8) very weakly protuberant. (9) Clypeus projecting approximately 0.71 of its length below lower margin of eyes; (11) surface without median longitudinal sulcation. (14) Distance between lateral ocelli subequal to distance between lateral ocellus and eye. (23) Flagellomere 1 slightly shorter than 2 along dorsal surface. Labrum as in Figure 383; (27) distal keel broad in frontal view, somewhat spoon-shaped; (28) distal lateral projections well developed, triangular, and sharply pointed; (29) fimbrial setae acutely pointed.

(32) Pronotal lateral angle broadly obtuse; (33) pronotal lateral ridge incomplete, interrupted by oblique lateral sulcus; (34) lower portion of lateral ridge narrowly rounded. (35) Mesoscutal lip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FIGURES 381–386.—*Lasioglossum desertum:* 381, female head; 382, male head; 383, female labrum; 384, male labrum; 385, female propodeum; 386, female mesoscutum.

weakly bilobed, (36) moderately elevated from pronotum. (40) Dorsal surface of propodeum about 0.76 the length of scutellum and about 1.3 times the length of metanotum, (41) slightly depressed centrally, (42) posterior margin broadly rounded; (43) propodeal triangle weakly defined, median V-shaped area inconspicuous, lateral rims absent; (44) lateral carinae extending less than half the length of posterior surface. (45) Tibial spur as in Figure 30.

(46) Lateral edge of metasomal tergum II weakly sinuate, nearly straight.

Sculpture: (47) Face shiny, (48) densely punctate below ocelli, punctures contiguous, becoming only slightly larger and less dense near antennae. (51) Supraclypeal area extremely granulate, (51) uniformly punctate, punctures 1–2 times their width apart. (53) Clypeus granulate basally, apical half polished; (54) punctures somewhat obscure, nearly contiguous basally, larger and less dense apically, apicolateral areas sparsely punctate. (56) Mesoscutum shiny; (57) punctation as in Figure 386, punctures separated by their width or less laterally, becoming granulopunctate anteriorly, less dense centrally, punctures separated by 1–4 times their width. (58) Scutellum sparsely punctate adjacent to median line, punctures 1–3 times their width apart. (63) Dorsal surface of propodeum (Figure 385) ruguloso-striolate, striae obscurely reaching posterior margin; (64) surface alveolated. (65) Metasomal tergum I moderately shiny; (66) punctation fine, dense, punctures slightly less than their width apart.

Coloration: (71) Wing membrane hyaline.

Vestiture: (74) Pubescence of head white. (75) Pubescence of thorax white; (76) mesoscutal hairs moderately dense, conspicuously plumose. (77) Hind tibial hairs concolorous, pale yellowish brown. (78) Anterior hairs of metasomal tergum I and (79) basal hair bands of terga II–IV white. (80) Acarinarium present (Figure 393), a large circular, glabrous area at base of tergum I, surrounded laterally and dorsolaterally by elongate hair fringes, dorsal opening of acarinarium wide, opening slightly wider than width of lateral hair fringe as seen in dorsal view.

MALE: Similar to female except as follows: (1) length 6.4–8.1 mm ($\bar{x}$ = 7.4, n = 20); (2) wing length 1.8–2.3 mm ($\bar{x}$ = 2.1, n = 20); (3) abdominal width 1.6–2.1 mm ($\bar{x}$ = 1.8, x = 20). (4) Head as in Figure 382 (length/width ratio 0.76–0.95, $\bar{x}$ = 0.86, n = 20). (5) Gena subequal to eye in width, (6) moderately produced posteriorly. (10) Clypeal surface shallowly depressed ventrally. Labrum as in Figure 384; (24) distal process absent; (25) basal area depressed medially; (26) basal lateral depressions absent. (30) Mandible short, just reaching opposing clypeal angle. (53) Clypeus polished; (54) punctures well formed and dense basally, very fine and scattered over apical two-thirds. (68) Clypeal maculation present. (69) Flagellum pale yellowish orange ventrally, strongly contrasting with dark dorsum or entirely dark. (72) Tarsi dark, concolorous with tibiae.

Vestiture: Sternal vestiture as in Figure 387; (82) hairs on sternum IV elongate, erect; (83) sternum V without conspicuous erect hairs, posterior edge of sternum with broadly rounded, moderately elongate and narrowly separated lat-

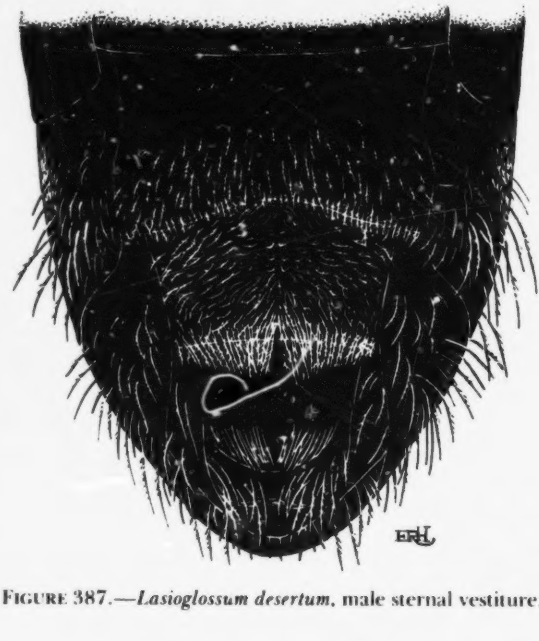

FIGURE 387.—*Lasioglossum desertum*, male sternal vestiture.

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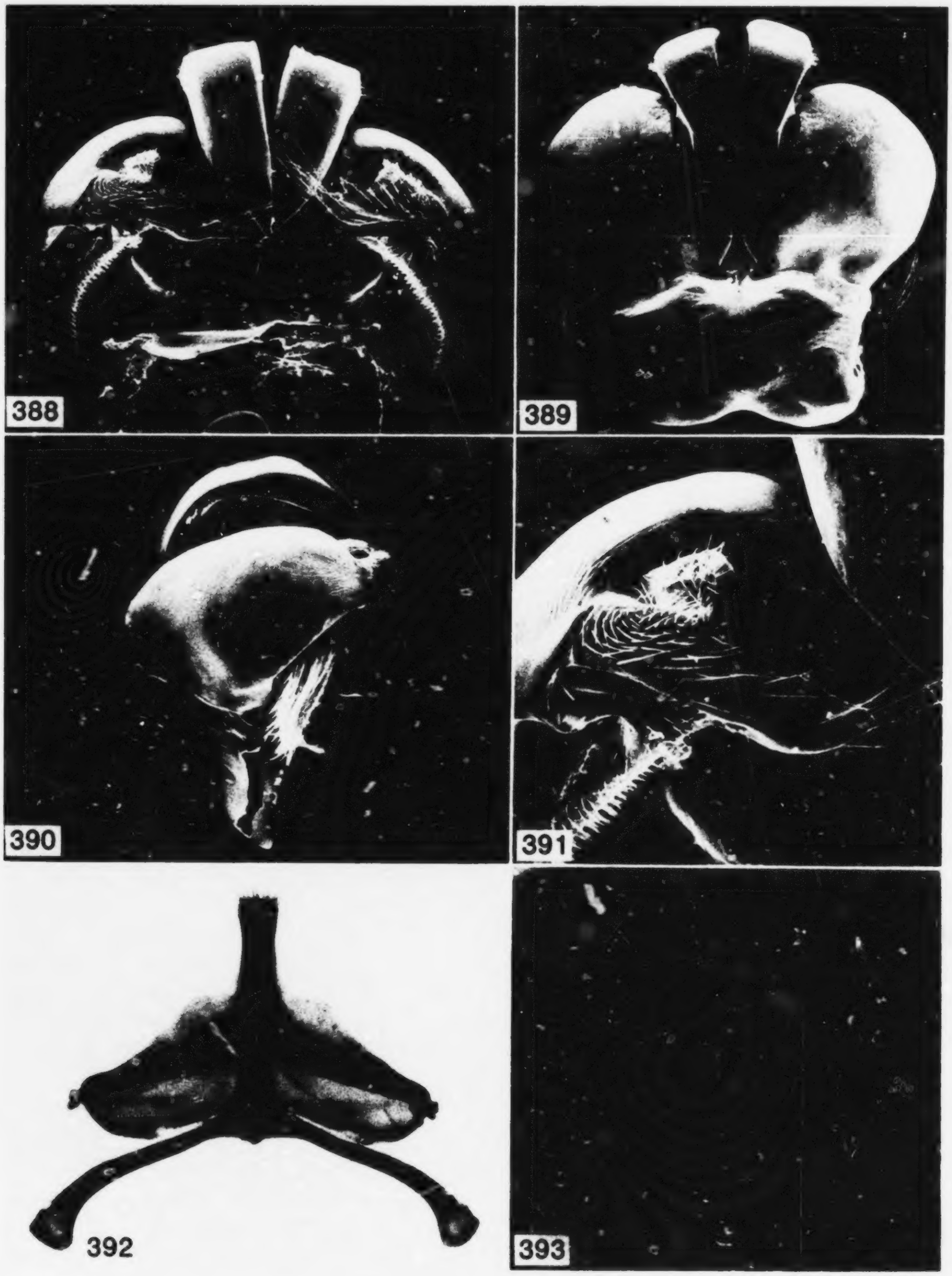


FIGURES 388–393.—*Lasioglossum desertum:* 388, male genitalia, ventral view; 389, same, dorsal view; 390, same, lateral view; 391, male gonostylus; 392, male sterna VII–VIII; 393, female acarinarium.

eral adpressed hair lobes.

Terminalia: Sterna VII–VIII as in Figure 392; (85) sternum VIII with extremely elongate, slender median process, slightly broader apically than along stem. Genitalia as in Figures 388–391; (86) gonobase moderately elongate; (87) gonostylus extremely elongate and slender; (89) retrorse membranous lobe slender; (90) volsella with prominent lateral lobe.

FLIGHT RECORDS (Figure 394).—*Lasioglossum desertum* females have been collected from late March through early November, with most records (82%) from June through August, with a peak in late July. The March and September records are from southern Arizona. The two October records are from San Luis Potosi and Jalisco, Mexico; the November record from Pima County, Arizona. Most males have been collected in August but records range from June through September.

FLOWER RECORDS.—Females (38): Cucurbitaceae 13%; Scrophulariaceae 13%; Compositae 11%. Males (34): Compositae 71%; Labiatae 24%. Total: 72 in 18 families, 28 genera as follows:

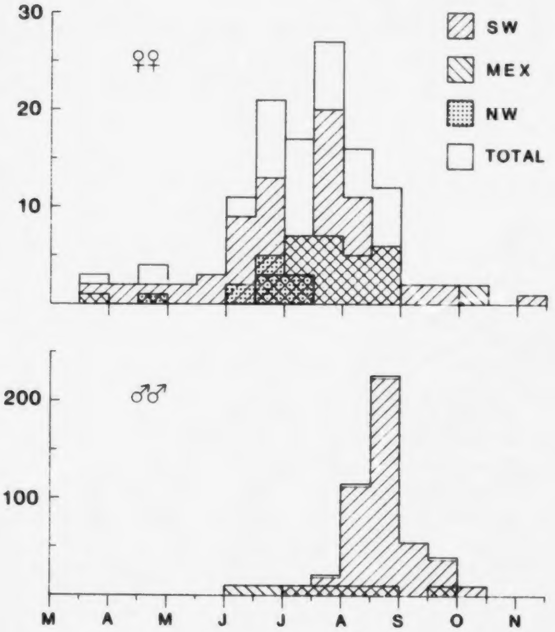


FIGURE 394.—*Lasioglossum desertum* flight records.

Arctostaphylos 1♀; *Aster* 22♂; *Baccharis* 1♂; *Ceanothus* 3♀; *Cucurbita* 1♀; *Engelmannia* 1♂; *Erigeron* 1♀; *Geranium* 2♀, 2♂; *Heliopsis* 2♀; *Heterotheca* 1♀; *Ipomoea* 2♀; *Iris* 1(1)♀; **Malvastrum* 1(1)♀; *Marrubium* 1♀; **Melilotus* 2(1)♀; *Monarda* 8♂; *Penstemon* 2♀; *Physocarpus* 2♀; **Pulsatilla* 1(1)♀; *Rhus* 1♀; *Rubus* 1♀; **Salix* 1(1)♀; *Schinus* 1♀; *Sicyos* 4♀; *Sisyrinchium* 1♀; *Sphaeralcea* 2♀; *Verbascum* 3♀; *Vitis* 1♀.

REMARKS.—Cockerell saw the type of *Halictus desertus* in the British Museum shortly before 1905 and published a short descriptive account of this specimen (Cockerell, 1905b). Eleven years later in his description of *H. cyaneiceps* (Cockerell, 1916), Cockerell compared this new species to *H. bardus*, *H. forbesii*, and *H. trizonatus* but made no mention of *H. desertus*. Cockerell later republished his notes on the Smith type (Cockerell, 1949) but it is apparent he never compared *H. cyaneiceps*, which he described from New Mexico, with *H. desertus* (described from Oaxaca, Mexico).

A number of male specimens examined in the present study appeared to be similar to those of *L. desertum* but differed in having slightly longer heads and more noticeable lateral hair lobes along the posterior edge of sternum V (similar to those of *L. argutum*, Figure 268). These may be shown to be the males of *L. rupticristum* (see *L. rupticristum* "Remarks" section for further details).

SPECIMENS EXAMINED.—545 (129♀, 416♂).

MEXICO. CHIHUAHUA: Canyon de la Noria (7 mi W Parrita); Madera; Rio Urique on La Bufa–Creel Road; Santa Barbara, 3 mi W; Kilo 36 Santa Barbara–Ojito; Pedernales, 2 mi W, 7 mi E; Villa Matamoris, 6 mi S. DURANGO: Durango, 10 mi W, 12 mi SW, 20 mi W; El Salto, 10, 18, 28 mi E; Las Puentes; Otinapa; Palos Colorados. DISTRITO FEDERAL: Guadalupe. HIDALGO: Baranca de San Vincente (Laredo Highway); Epazoyucan; Pachuca, 3, 5 mi W, 5 mi N; Tulancingo, 7 mi S. JALISCO: Guadalajara, 126 mi E. MEXICO: Chapingo, 8 km S; Texcoco. OAXACA: Yanhuitlan, 11.4 km N. PUEBLA: Puebla; 35 mi SE. SAN LUIS POTOSI: San Luis Potosi, 18 mi SW. TLAXCALA: Apizaco, 10 mi N.

UNITED STATES. ARIZONA: *Cochise Co.; Coconino Co.; Greenlee Co.:* Rose Peak (30 mi N Clifton); *Pima Co.; Santa Cruz Co.:* Canelo, Madera Canyon, Palmerlea, Sonoita Creek (8 mi S Patagonia); *Yavapai Co.:* Prescott, 1 mi S. COLORADO: *Boulder Co.:* Boulder; *Douglas Co.; Elbert Co.:* Running Creek

Field Station; *El Paso Co.:* Foster Ranch, Garden of Gods; *Fremont Co.:* Coaldale, 5 mi S. MONTANA: *Musselshell Co.:* Roundup, 18 mi S. NEBRASKA: *Dawes Co.:* Chadron; *Sioux Co.:* Jim Creek. NEW MEXICO: *Colfax Co.:* Eagle Nest, 5 mi E; *Grant Co.:* McMillan Camp (13 mi N Silver City); *Hidalgo Co.:* Rodeo; *Lincoln Co.:* Alto, Corona (Gallinas Peak), Rio Ruidosa (White Mts.); *San Miguel Co.:* Pecos, Sapello; *Santa Fe Co.:* Santa Fe. SOUTH DAKOTA: *Custer Co.:* Custer State Park; *Pennington Co.:* Battlecreek (4 mi SE Keystone). TEXAS: *Jeff Davis Co.:* Davis Mt. UTAH: *Grand Co.:* Moab, La Sal Mt.; *San Juan Co.:* Kigalie Ranger Station (La Sal National Forest). WYOMING: *Crook Co.:* Devil's Tower.

17. *Lasioglossum eickworti*, new species

FIGURES 32, 395–405

TYPE MATERIAL.—The holotype female is deposited in the Cornell University Insect Collection. It is labeled

EL SALVADOR Cerro Verde 1 Oct 1977 P. Bernhardt MH68 [?]/HOLOTYPE Lasioglossum eickworti R.J. McGinley [red label].

The holotype is missing the right antenna, the distal 9 flagellomeres of the left antenna, and the distal tarsomere of the right hand leg but is otherwise in good condition. Ten female and four male paratypes, listed in the "Specimens Examined" section, are in the collections of Cornell University, Canadian National Collection (Ottawa), and the Los Angeles County Museum.

ETYMOLOGY.—This species is named after G.C. Eickwort (Cornell University), who generously provided me with most of the specimens available for study, and who greatly aided this project with many detailed discussions of halictine systematics.

DISTRIBUTION (Figure 395).—*Lasioglossum eickworti* is presently known from only 11 females and four males. These specimens have been collected from Chiapas, Mexico, south to Guatemala, El Salvador, and Costa Rica.

DIAGNOSIS.—The large size (length 9.5–10.7 mm, $\bar{x} = 10.0$), slender body form, sharply-edged and produced upper portion of the pronotal

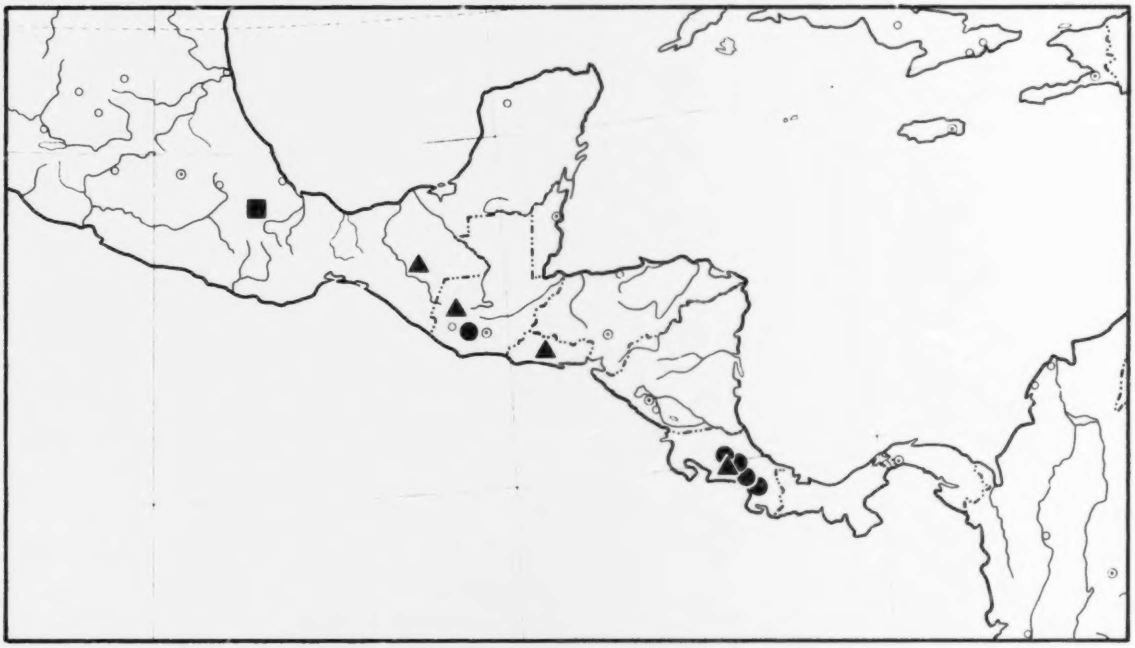


FIGURE 395.—Distribution of *Lasioglossum eickworti* (triangle), *L. katyae* (circle), and *L. sandrae* (square).

lateral carina (Figure 405), infuscated anterior edge of the forewing (as in Figure 1), distinctive dorsal propodeal surface (elongate and narrowly rounded posteriorly), and characteristic short, adpressed hairs on the anterior surface of metasomal tergum I will distinguish the females of *L. eickworti, L. sandrae,* and *L. katyae* from those of all other New World *Lasioglossum.* These three species apparently form a natural group as evidenced by the presumed apomorphic characters listed above.

Lasioglossum sandrae is easily differentiated from *L. eickworti* and *L. katyae* and other New World *Lasioglossum* in having the mesoscutum and metasomal terga IV–V covered by short, adpressed, pale hairs. The only other *Lasioglossum* species having terga IV–V entirely covered by adpressed, pale pubescence are *L. tropidonotum, L. cercothrix,* and *L. crocoturum.* The latter species are much smaller than *L. sandrae* and lack adpressed mesoscutal hairs. *Lasioglossum sandrae* also has a unique transverse depression near the apical clypeal edge.

Unlike *L. sandrae, L. eickworti* and *L. katyae* have relatively elongate, dark brown to black mesoscutal hairs. The latter two species can be differentiated on the basis of mesoscutal punctation. The mesoscutum of *L. eickworti* is entirely granuloso-punctate, becoming scabrous anteriorly, whereas that of *L. katyae* is uniformly doubly-punctate with the smaller punctures being much finer than those of *L. eickworti.*

Of the three species, only males of *L. eickworti* are known. In addition to the female diagnostic characters listed above, these males are unusual in having extremely elongate mandibles that reach the opposing mandibular bases and strongly produced, tuberculate genal lobes, which are unique among New World *Lasioglossum* (Figure 401).

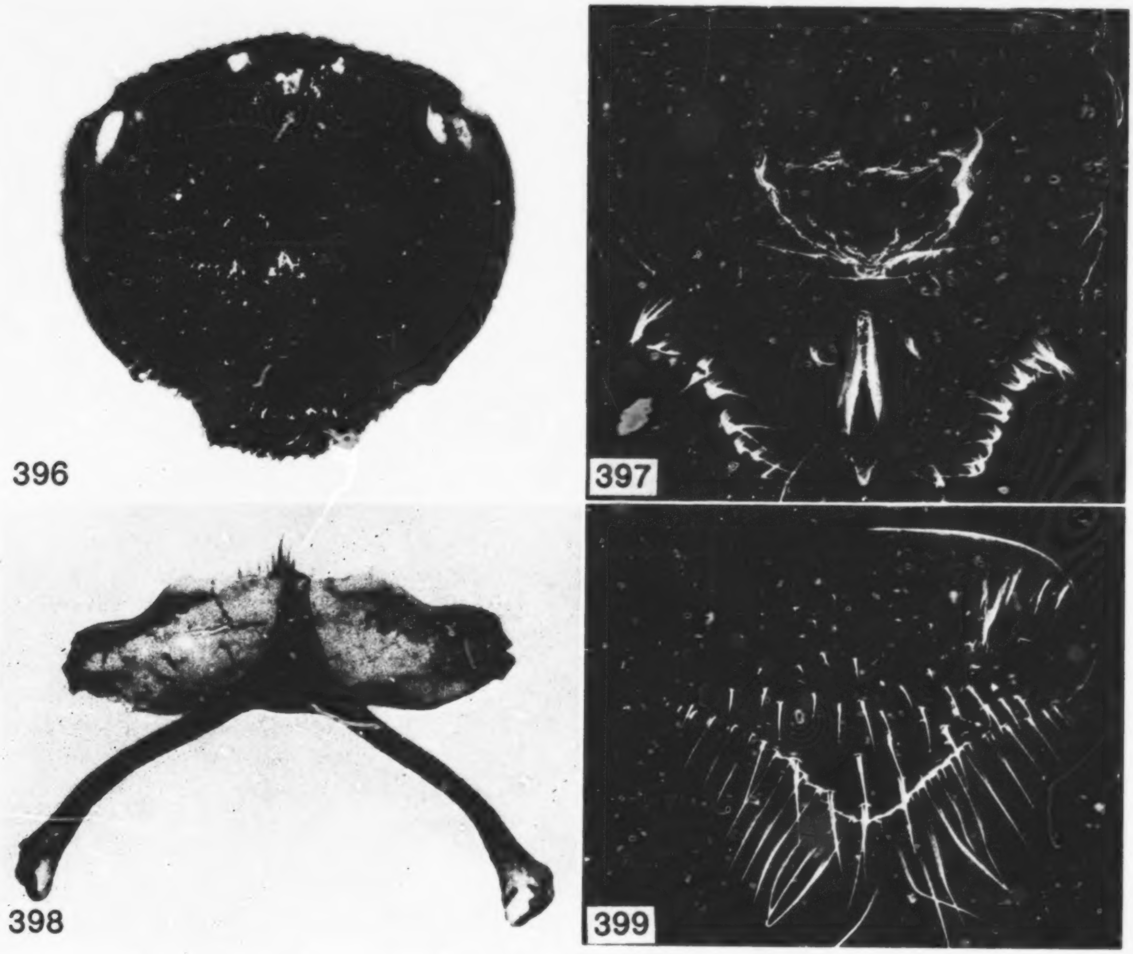
DESCRIPTION.—FEMALE: (1) Length 9.5–10.7 mm ($\bar{x}$ = 10.0, n = 6); (2) wing length 3.0–3.2 mm ($\bar{x}$ = 3.1, n = 6); (3) abdominal width 2.8–2.9 mm ($\bar{x}$ = 2.9, n = 6).

Structure: (4) Head moderately short (Figure 396; length/width ratio 0.85–0.96, $\bar{x}$ = 0.89, n = 6). (7) Supraclypeal area narrowly rounded dorsally near well-developed carina, (8) area strongly protuberant. (9) Clypeus projecting approximately 0.92 of its length below lower margin of eyes; (11) surface without median longitudinal sulcation. (14) Distance between lateral ocelli subequal to distance between lateral ocellus and eye. (23) Flagellomere 1 subequal to 2 in length along dorsal surface. Labrum as in Figure 397; (27) distal keel moderately broad, lateral edges bowed; (28) distal lateral projections small but distinct, conical; (29) fimbrial setae acutely pointed.

(32) Pronotal lateral angle very narrowly obtuse, sharply pointed; (33) pronotal lateral ridge incomplete, very narrowly interrupted by oblique lateral sulcus; (33) upper portion of lateral ridge strongly carinate, lower portion broadly rounded. (35) Mesoscutal lip weakly bilobed, (36) moderately elevated from pronotum. (40) Dorsal surface of propodeum about 0.78 the length of scutellum and about 1.6 times the length of metanotum, (41) not depressed centrally, (42) posterior margin broadly rounded; (43) propodeal triangle well defined by carinate rim (V-shaped medial impression and lateral rims not elevated); (44) lateral carinae extending approximately two-thirds the length of posterior surface. (45) Tibial spur as in Figure 32.

(46) Lateral edge of metasomal tergum II broadly convex anteriorly, straight posteriorly.

Sculpture: (47) Face shiny, (48) densely and uniformly punctate between ocelli and antennae, punctures contiguous. (51) Supraclypeal area extremely granulate; (52) uniformly punctate, punctures separated by 1–3 times their width. (53) Clypeus granulate over basal one-third, obscurely granulate over apical two-thirds; (54) punctures separated by less than their width basally, separated by 1–2 times their width on apical two-thirds. (56) Mesoscutum moderately dull; (57) doubly-punctate, smaller punctures extremely dense, contiguous throughout, larger punctures separated by 2–4 times their width. (58) Scutellum nearly uniformly punctate, punctures separated at most by their width. (63) Dor-



FIGURES 396–399.—*Lasioglossum eickworti:* 396, female head; 397, female labrum; 398, male sterna VII–VIII; 399, male labrum.

sal surface of propodeum striolate laterally, ruguloso-striolate medially, striae and rugulae reaching posterior margin laterally and along median line, propodeum smooth adjacent to median line; (64) surface obscurely alveolated. (65) Metasomal tergum I moderately dull; (66) punctation fine, extremely dense, punctures nearly contiguous.

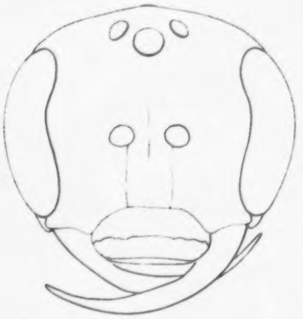
Coloration: (70) Posterior half of wing membrane lightly infuscated to hyaline, anterior one-third to one-half deeply infuscated.

Vestiture: (74) Pubescence of head mostly dark brown, pale brown on postgena, some whitish hairs near antennal sockets. (75) Pubescence of thorax mostly dark brown, hairs white on pronotal lobe and propodeum, some white hairs on metanotum; (76) mesoscutal hairs short, moderately dense and plumose. (77) Hind tibial hairs concolorous, dark brown. (78) Anterior hairs of metasomal tergum I and (79) basal hair bands of terga II–IV white. (80) Acarinarium apparently absent, anterior surface of tergum I with short, adpressed hairs surrounded laterally by elongate hairs. (81) Unlike most species, hair bands of terga II–III narrow, covering at most basal 0.25 of terga, tergum IV hair band absent.

MALE: Similar to female except as follows: (1) length 8.7–10.1 mm ($\bar{x}$ = 9.3, n = 3); (2) wing length 2.6–2.7 mm ($\bar{x}$ = 2.6, n = 3); (3) abdominal width 1.9–2.1 mm ($\bar{x}$ = 2.0, n = 3). (4) Head as in Figure 400 (length/width ratio 0.85–0.92, $\bar{x}$ = 0.88, n = 3). (5) Gena wider than eye, (6) strongly produced posteriorly with conspicuous angulate projection (Figure 401). (10) Clypeal surface rounded. Labrum as in Figure 399; (24) distal process moderately long, narrowly rounded; (25) basal area depressed medially; (26) basal lateral depressions conspicuously developed. (30) Mandible extremely elongate, reaching opposing mandibular base. (53) Clypeus strongly granulate along basal edge, apical two-thirds polished; (54) punctation somewhat uniform, apical punctures larger and less dense than basal punctures. (68) Clypeal maculation present (Figure 400). (69) Flagellum entirely dark. (72) Tarsi dark, concolorous with tibiae.

Vestiture: (82) Hairs on sternum IV moderately short, suberect; (83) hairs on sternum V short, sternum without noticeable hair patterns or lobes (very faint suggestion of lateral hair lobes on posterior sternal edge).

Terminalia: Sterna VII–VIII as in Figure 398; (85) sternum VIII without median process. Genitalia as in Figures 402–404; (86) gonobase very short; (87) gonostylus very robust, rounded apically; (89) retrorse membranous lobe inconspicuous, extremely reduced and slender; (90) volsella extremely reduced, lacking lateral lobe (the penis valves of *L. eickworti* differ greatly from those of other New World *Lasioglossum* species in being highly angulate and sharply edged).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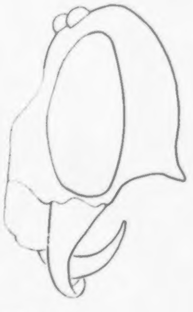

401

FIGURES 400, 401.—*Lasioglossum eickworti*, male head: 400, frontal view; 401, lateral view.

FLIGHT RECORDS.—Females of *L. eickworti* have been collected in June through early October, with most records (5) from October. One male was collected in April, two others were taken in August.

REMARKS.—One female specimen in the collection of the University of California, Berkeley, bears the following label:

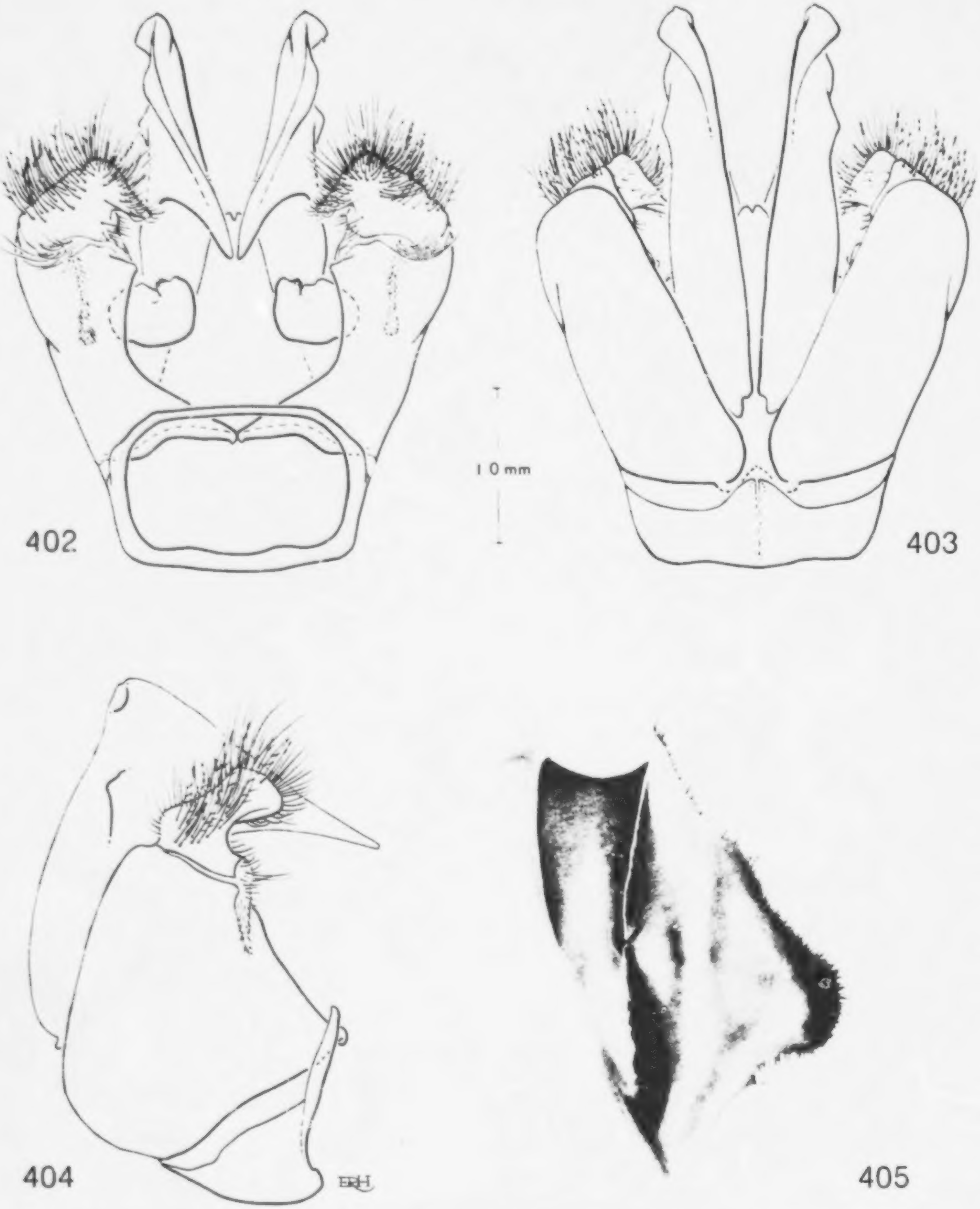
n.g. [new genus] ? nr. [near] Lasioglossum det. G.C. Eickwort.

Indeed, *L. eickworti, L. sandrae,* and *L. katyae* share numerous characters (listed in the above diagnosis) that appear to set them off as a natural group. In addition, the genitalia of the *L. eickworti* male is extremely different from that of all other known New World *Lasioglossum* (Figures 402–404; males of *L. sandrae* and *L. katyae* are not known). I originally considered recognizing this group as a distinct genus but now think this would be premature. Through the kindness of Laurence Packer (University of Toronto), I was able to examine genitalic preparations of many Old World *Lasioglossum* species. The diversity of genitalic structure in this material is high (much greater than is found among New World species) and some are at least superficially similar to the genitalia of *L. eickworti.* Because of this I hesitate to accord these three New World forms even subgeneric status at present. Such a designation may prove to be desirable but should await a rigorous phylogenetic review of both New and Old World *Lasioglossum.*

SPECIMENS EXAMINED.—15 (11♀, 4♂).

COSTA RICA. Unspecified locality, no date, Schild & Burgdorf (1♂; CU).

EL SALVADOR. Parque Nacional del Cerro Verde, 5 Jul 1963, 6800 ft, Scullen & Bolinger (2♀; OrS); Cerro Verde, 29 Jun 1963, M.E. Irwin, D.Q. Cavagnaro (1♀; UCB), 22 Sep 1976, P. Bernhardt (1♀; CU), 1–21 Oct 1976, P.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1.0 mm
403
404
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405

FIGURES 402–405.—*Lasioglossum eickworti:* 402, male genitalia, ventral view; 403, same, dorsal view; 404, same, lateral view; 405, female pronotum, lateral view.

Bernhardt (3♀; CU), 1 Oct 1977, P. Bernhardt (2♀, includes holotype; CU).

GUATEMALA. Chicastenango, Aug 1959, N.L.H. Krauss (1♂; KU); Solola (12 km SSE Nahuala), 14 Aug 1974, 2275 m, E.M. & J.L. Fisher (1♂; LACM).

MEXICO. CHIAPAS: San Cristobal de las Casas, 13 Aug 1959, N.L.H. Krauss (1♀; KU), 3 mi N, 4 Jun 1969, 7000 ft, J.W. Boyes (1♀; CNC); Nachic, 27 Apr 1959, 8000 ft, H.E. Evans (1♂; CU).

THE *forbesii* GROUP

SPECIES INCLUDED.—*Lasioglossum acuminatum*, new species; *L. forbesii* (Robertson); *L. paraforbesii*, new species.

DISTRIBUTION (Figure 406).—The *forbesii* group is widespread throughout much of Canada and the United States, occurring from New Brunswick to Alberta and Idaho and south to New Mexico, Oklahoma, Arkansas, and North Carolina.

DIAGNOSIS.—The females of the *forbesii* group all have slightly elevated lateral rims on the posterior margin of the dorsal propodeal surface. This will separate them from other females that have an acarinarium on the anterior surface of tergum I, especially those of the *trizonatum* group and *L. colatum*. The acarinarium of *L. acuminatum* is highly distinctive in being arrow-shaped (Figure 407), and that of *L. forbesii* is also diagnostic in having only a very narrow dorsal open-

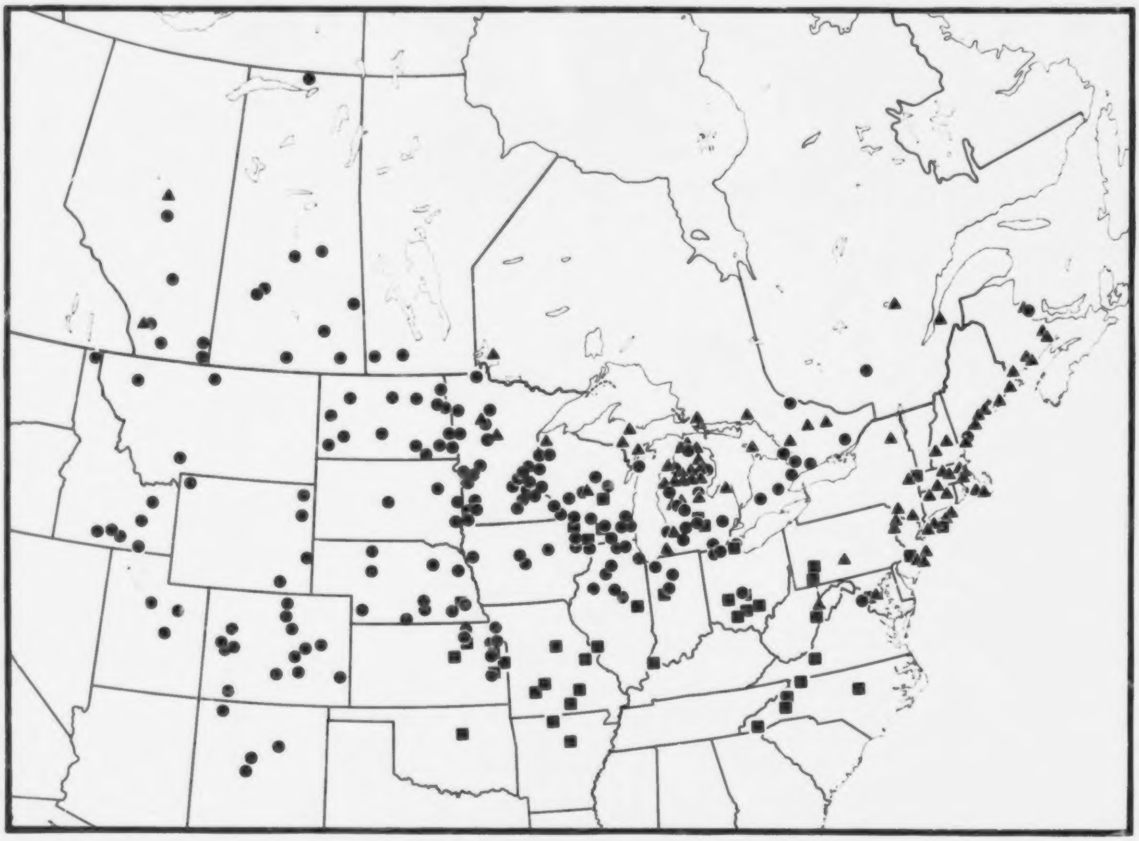

FIGURE 406.—Distribution of *Lasioglossum forbesii* group: *L. acuminatum* (triangle), *L. forbesii* (square), *L. paraforbesii* (circle).

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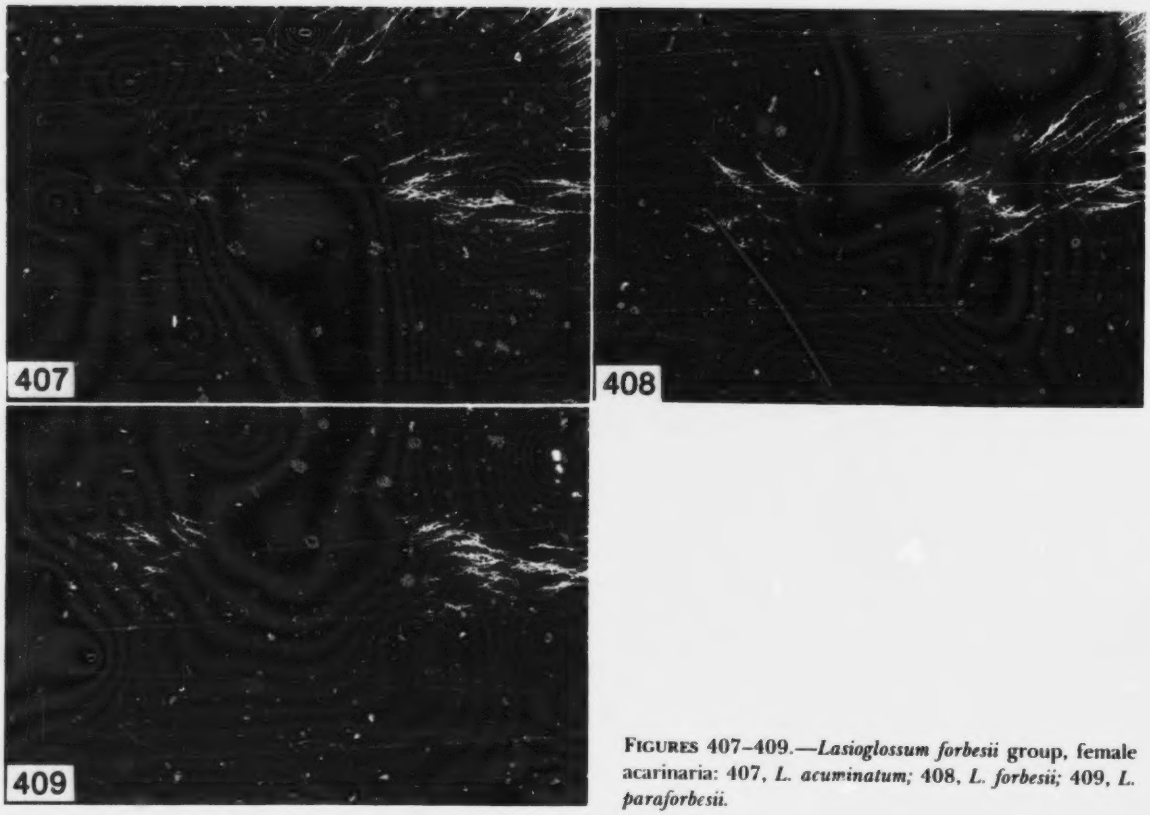


Figures 407–409.—*Lasioglossum forbesii* group, female acarinaria: 407, *L. acuminatum;* 408, *L. forbesii;* 409, *L. paraforbesii.*

ing to the hair fringe surrounding the central glabrous area (Figure 408). The acarinarium of *L. paraforbesii* is not so distinctive (Figure 409) but the density of the associated fringe hairs and their sharply delimited central border will separate *paraforbesii* from similar species, e.g., *L. trizonatum* (Figure 693) and *L. colatum* (Figure 351). Females of the *forbesii* group can also be distinguished from the similar *trizonatum* females by their generally shorter heads (Figures 410, 425, 434, length/width ratio averages are 0.89, 0.90 and 0.92 for each species, n = 20 for each; compare with *trizonatum* females, Figures 670, 683, where averages range from 0.93 to 1.02).

The yellow tarsi and flat clypeal surface will separate the *forbesii* group males from those of other *Lasioglossum* species except for *L. chanelense* and *L. mellipes* (both of which actually have yellowish orange tarsi). The latter species occur outside the range of the *forbesii* group and have either erect lateral hair tufts or a median rosette of erect hairs on sternum V (Figures 325, 701, 702; vestiture on sternum V of *forbesii* males inconspicuous, without noticeable pattern, Figure 416). Other males with yellow tarsi have the clypeal surface rounded and differ from *forbesii* males in the following additional characters: *L. fuscipenne* males have the posterior half of sterna II–IV densely covered by short, adpressed hair patches (Figure 189); *L. leucozonium* males have a unique V-shaped hair patch on sternum V (Figure 204); *L. lampronotum* males have a conspicuously wider head (Figure 487, length/width ratio $\bar{x} = 0.82$); *L. titusi* males have the mesoscutum virtually impunctate and have much shorter heads (Figure 633, length/width ratio $\bar{x} = 0.85$, $n = 15$).

DISCUSSION.—Besides having an acarinarium on the first tergum of the females, the *forbesii* group species, which occur primarily in the eastern United States, are somewhat generalized in appearance and have been commonly confused with those of the *trizonatum* group, their counterpart in the western United States (see above diagnosis for distinguishing characters) and even *L. coriaceum*. Cockerell (1898c) states that he

> examined a great number of *coriaceus* from Wash.[ington state], and various specimens from New Mexico and Illinois, considered to be *forbesii*; also an Illinois *coriaceus* from Mr. Robertson. The result of this study is that I believe all belong to one somewhat variable species.

Cockerell's study was superficial, and he was further hindered by examining misidentified *L. coriaceum* from Washington, which were undoubtedly specimens of the *trizonatum* group (*L. coriaceum* and species of the *forbesii* group are not found in Washington state). Cockerell's statement is nevertheless indicative of the confusion that has surrounded specimens of the *trizonatum* and *forbesii* species groups.

It has long been apparent that the original, inclusive concept of *L. forbesii* as one species included high levels of variability in head shape, mandible length in the males, and great differences in body size among other characters. Cockerell (1898c:51) says that

> it is to be remarked, however, that Robertson's description of the metathoracic enclosure [dorsal propodeal surface] of *forbesii*, bearing irregular radiating rugae, which reach the posterior margin, will hardly apply to what I have . . . regarded as that species . . . .

The development of the propodeal rugae and the structure of the posterior propodeal edge are features that are now known to vary between species of the *forbesii* group and Cockerell's comments foreshadowed this understanding. Upon examining the abdominal acarinarium of hundreds of specimens, it became apparent that three forms are actually involved, herein recognized as species. Females of *L. acuminatum* have a very unique acarinarium, the glabrous area of which is arrow-shaped and pointed dorsally (Figure 407). The males of *L. acuminatum* have very elongate mandibles that nearly reach the opposing mandibular bases and very wide, angulate genae and as a result have been commonly misidentified as *L. coriaceum*. Males of the latter species have dark tarsi and a non-elevated anterior mesoscutal edge (tarsi yellow and mesoscutum elevated in all *forbesii* group males). The females of *L. forbesii* and *L. paraforbesii* differ in acarinarial shape, head length, propodeal structure, and overall body size as detailed in the following species treatments. The males of these two forms apparently differ in head shape but cannot be reliably separated at present (*L. forbesii* length/width ratio $\bar{x} = 0.90$, *L. paraforbesii* $\bar{x} = 0.93$, $n = 20$ for each).

As for the *trizonatum* complex, it should be emphasized that the present treatment of the *forbesii* group is only preliminary in nature. Much more information on variability is needed and the possibility of hybridization addressed. Most helpful would be biological studies in those areas where the different forms are known to be sympatric.

18. *Lasioglossum acuminatum*, new species

FIGURES 15, 406–407, 410–424

TYPE MATERIAL.—The female holotype of *L. acuminatum* is deposited in the National Museum of Natural History, Smithsonian Institution. The specimen is missing the left hind leg beyond the coxa but is otherwise in excellent condition. It is labeled

> NEW HAMPSHIRE: Sullivan Co.[unty], Lempster, 23-VI [June]-1976 FC&BJ Thompson/HOLOTYPE Lasioglossum acuminatum R.J. McGinley [red label].

Ninety-eight paratypes (77♀, 21♂) listed in the "Specimens Examined" section are designated.

ETYMOLOGY.—The specific epithet is derived from the Latin *acumin* (a point), alluding to the uniquely pointed, arrow-shaped acarinarium on the anterior surface of tergum I of the females.

DISTRIBUTION (Figure 406).—*Lasioglossum acuminatum* is primarily found in Canada and northern United States, from New Brunswick south to Pennsylvania and West Virginia, west through Michigan and Minnesota to central Alberta.

DIAGNOSIS.—The females of *L. acuminatum* can be distinguished from those of all other *Lasioglossum* species by the shape of the acarinarium on the anterior surface of tergum I, which is uniquely pointed and arrow-shaped (Figure 407). Other useful characters are the slightly elevated lateral rims on the posterior margin of the dorsal propodeal surface (Figure 414, characteristic of other *forbesii* group females) and the only moderately elongate head (Figure 410, length/width ratio $\bar{x} = 0.90$, $n = 20$).

Lasioglossum acuminatum males have the yellow tarsi typical of other *forbesii* group males but have extremely elongate mandibles that nearly reach the opposing mandibular bases (Figure 411), very broad, moderately angulate genae that are slightly wider than the width of the compound eye as seen in lateral view and elongate hairs on sternum IV that are subequal in length to those on sternum III as seen in lateral view (Figure 418). *Lasioglossum forbesii* and *L. paraforbesii* males have shorter mandibles that at most reach only slightly beyond the opposing clypeal angles (Figures 426, 435) and shorter hairs on sternum IV than on sternum III (Figure 417). The gena of *L. forbesii* males is always narrower than the width of the eye as seen in lateral view, whereas that of *L. paraforbesii* is variable, in some cases subequal in width to the eye.

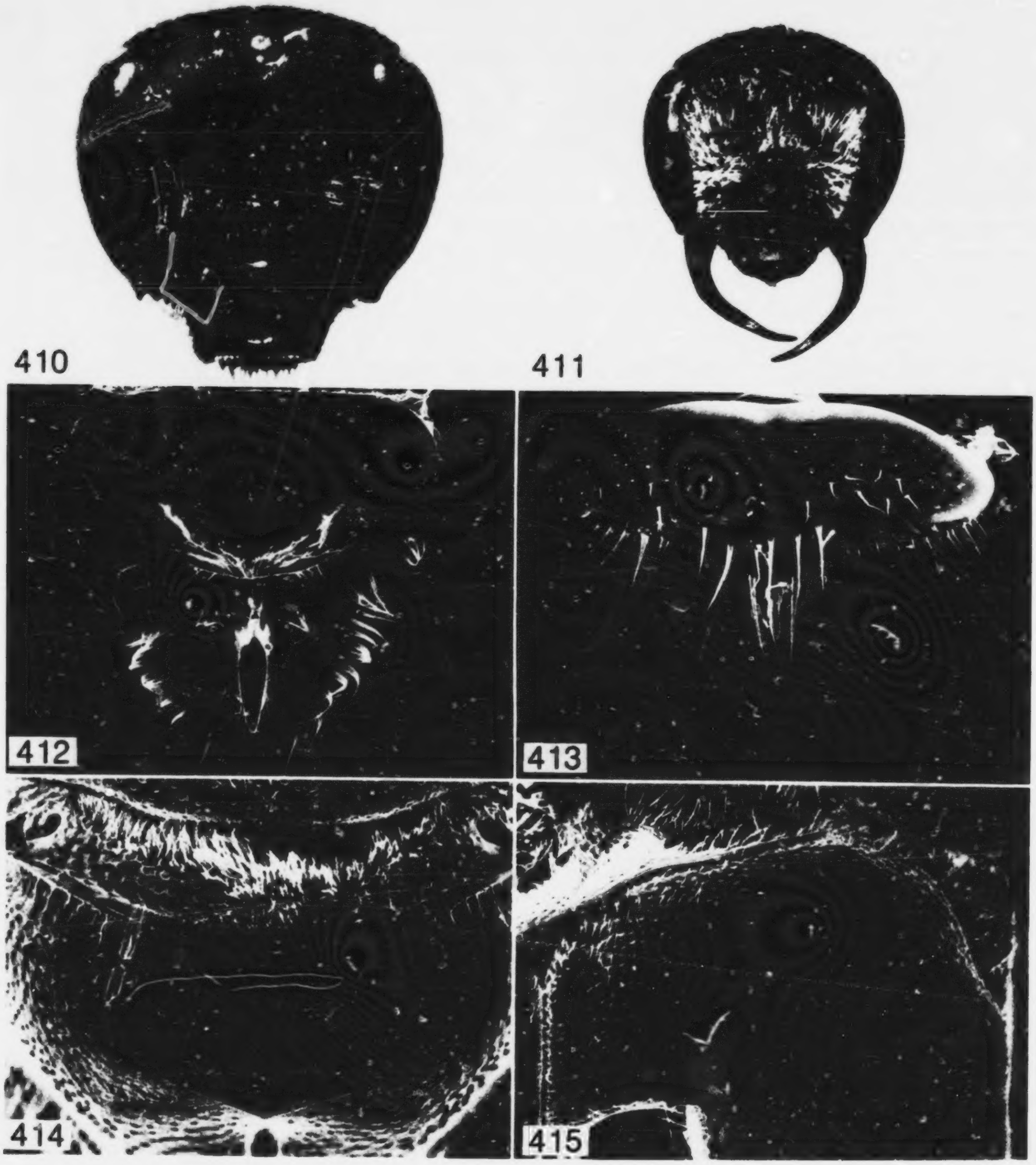
DESCRIPTION.—FEMALE: (1) Length 8.0–10.3 mm ($\bar{x} = 9.2$, $n = 20$); (2) wing length 2.6–2.9 mm ($\bar{x} = 2.8$, $n = 20$); (3) abdominal width 2.7–3.2 mm ($\bar{x} = 3.0$, $n = 20$).

Structure: (4) Head moderately elongate (Figure 410, length/width ratio 0.85–1.0, $\bar{x} = 0.91$, $n = 20$). (7) Supraclypeal area evenly rounded, (8) moderately protuberant. (9) Clypeus projecting approximately 0.91 of its length below lower margin of eyes; (11) surface without median longitudinal sulcation. (14) Distance between lateral ocelli subequal to distance between lateral ocellus and eye. (23) Flagellomere 1 subequal in length to 2 along dorsal surface. Labrum as in Figure 412; (27) distal keel moderately broad as seen in frontal view, slightly widest basally; (28) distal lateral projections somewhat moderately well developed, triangular; (29) fimbrial setae acutely pointed.

(32) Pronotal lateral angle narrowly obtuse; (33) pronotal lateral ridge incomplete, interrupted by oblique lateral sulcus; (34) lower portion of lateral ridge sharply edged. (35) Mesoscutal lip weakly bilobed, (36) moderately elevated from pronotum. (40) Dorsal surface of propodeum about 0.79 the length of scutellum and about 1.5 times the length of metanotum, (41) slightly depressed centrally, (42) posterior margin broadly rounded; (43) propodeal triangle weakly defined laterally, evident medially as a V-shaped elevation with distinct lateral rims, fading towards mesonotum; (44) lateral carinae extending at most half the length of posterior surface. (45) Tibial spur as in Figure 15.

(46) Lateral edge of metasomal tergum II weakly sinuate, nearly straight.

Sculpture: (47) Face shiny, (48) densely punctate below ocelli, punctures contiguous, becoming larger and less dense near antennae. (51) Supraclypeal area weakly granulate, (51) punctation nearly uniform, punctures separated by their width laterally, slightly less dense centrally. (53) Clypeus granulate along basal edge; (54) punctures separated by their width or slightly less, apicolateral areas virtually impunctate. (56) Mesoscutum dull; (57) punctation as in Figure 415, punctures separated by their width or less laterally and anteriorly, less dense centrally, punctures 1–4 times their width apart. (58) Scutellum with conspicuous impunctate areas adjacent to median line. (63) Dorsal surface of propodeum (Figure 414) variable in sculpture, completely to incompletely ruguloso-striate; (64) surface alveolated. (65) Metasomal tergum I moderately shiny; (66) punctation fine, dense,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Figures 410–415.—*Lasioglossum acuminatum:* 410, female head; 411, male head; 412, female labrum; 413, male labrum; 414, female propodeum; 415, female mesoscutum.

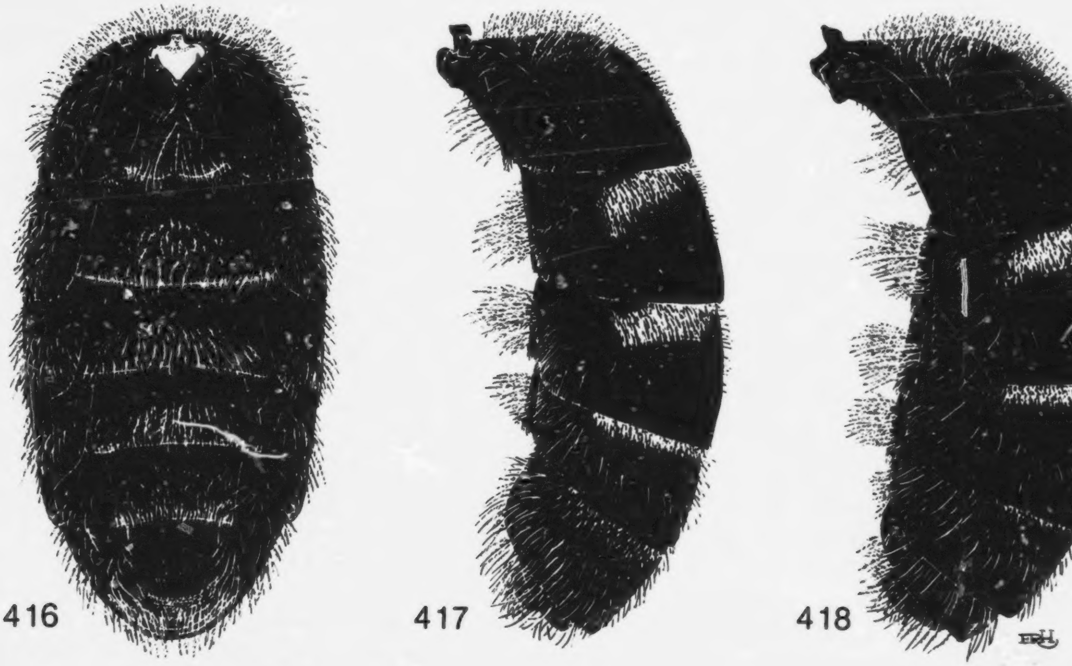
punctures slightly less than their width apart.

Coloration: (71) Wing membrane pale yellowish brown.

Vestiture: (74) Pubescence of head yellowish white. (75) Pubescence of thorax yellowish white; (76) mesoscutal hairs moderately sparse and plumose. (77) Hind tibial hairs concolorous, yellowish brown. (75) Anterior hairs of metasomal tergum I pale yellowish brown, (77) basal hair bands of terga II–IV white. (80) Acarinarium present (Figure 407), a relatively small, arrowhead-shaped, glabrous area surrounded laterally by elongate fringe hairs, dorsal opening of acarinarium very narrow, width of opening approximately one-half the width of lateral fringe hairs as seen in dorsal view; unlike most species, each side of tergum I with conspicuous bald areas posteriad of acarinarial fringe hairs.

MALE: Similar to female except as follows: (1) length 7.2–8.8 mm ($\bar{x}$ = 8.2, n = 20); (2) wing length 2.1–2.5 mm ($\bar{x}$ = 2.3, n = 20); (3) abdominal width 1.8–2.3 mm ($\bar{x}$ = 2.1, n = 20). (4) Head as in Figure 411 (length/width ratio 0.91–1.0, $\bar{x}$ = 0.95, n = 20). (5) Gena slightly wider than eye, (6) strongly produced posteriorly. (10) Clypeal surface conspicuously flattened dorsally, shallowly depressed ventrally. Labrum as in Figure 413; (24) distal process developed as a moderately elongate, acute projection; (25) basal area depressed medially; (26) basal lateral depressions absent. (30) Mandible extremely elongate, reaching just short of opposing mandibular base. (53) Clypeus polished; (54) punctures well formed and dense basally, very fine and scattered over apical two-thirds. (68) Clypeal maculation present. (69) Flagellum pale yellowish orange ventrally, contrasting with dark dorsum. (72) Tarsi yellow to yellowish orange.

Vestiture: Sternal vestiture as in Figure 418; (82) hairs on sternum IV erect, elongate medially, becoming shorter laterally (in lateral view, hairs of sternum IV subequal in length to those



FIGURES 416–418.—*Lasioglossum forbesii* group, male sternal vestiture: 416, *L. forbesii* abdomen, ventral view; 417, same, lateral view; 418, *L. acuminatum* abdomen, ventral view.

of sternum III, Figure 418; hairs of sternum IV relatively shorter in *L. forbesii* and *L. paraforbesii*); (83) sternum V without noticeable erect hairs or posterior hair lobes.

Terminalia: Sterna VII–VIII as in Figure 423; (85) sternum VIII with elongate, slender median process, broader apically than along stem. Genitalia as in Figures 419–422; (86) gonobase moderately elongate; (87) gonostylus broad, moderately elongate, narrowly rounded apically; (89) retrorse membranous lobe extremely slender; (90) volsella with very prominent lateral lobe.

Flight Records (Figure 424).—Females of *L. acuminatum* have been collected from April through October, with most records from June (50%). Males have been collected primarily in August and September, but one was taken in June (Barnstable County, Massachusetts) and six in late July.

Flower Records.—Females (54): Ericaceae 46%; Rosaceae 17%; Compositae 11%. Males (49): Compositae 94%. Total: 103 in 13 families, 17 genera as follows:

Acer 1(1)♀; *Asclepias* 2♂; *Apocynum* 1♀; **Brassica* 1(1)♀; *Chamaedaphne* 1♀; *Clethra* 1♂; **Lysimachia* 1(1)♀; *Melilotus* 1♀; *Rhododendron* 3♀; *Prunus* 1♀; *Pyrus* 2♀; **Rosa* 3(3)♀; **Rubus* 6(2)♀; **Salix* 4(1)♀; **Solidago* 6(6)♀, 46♂; *Vaccinium* 21♀; *Viburnum* 2♀.

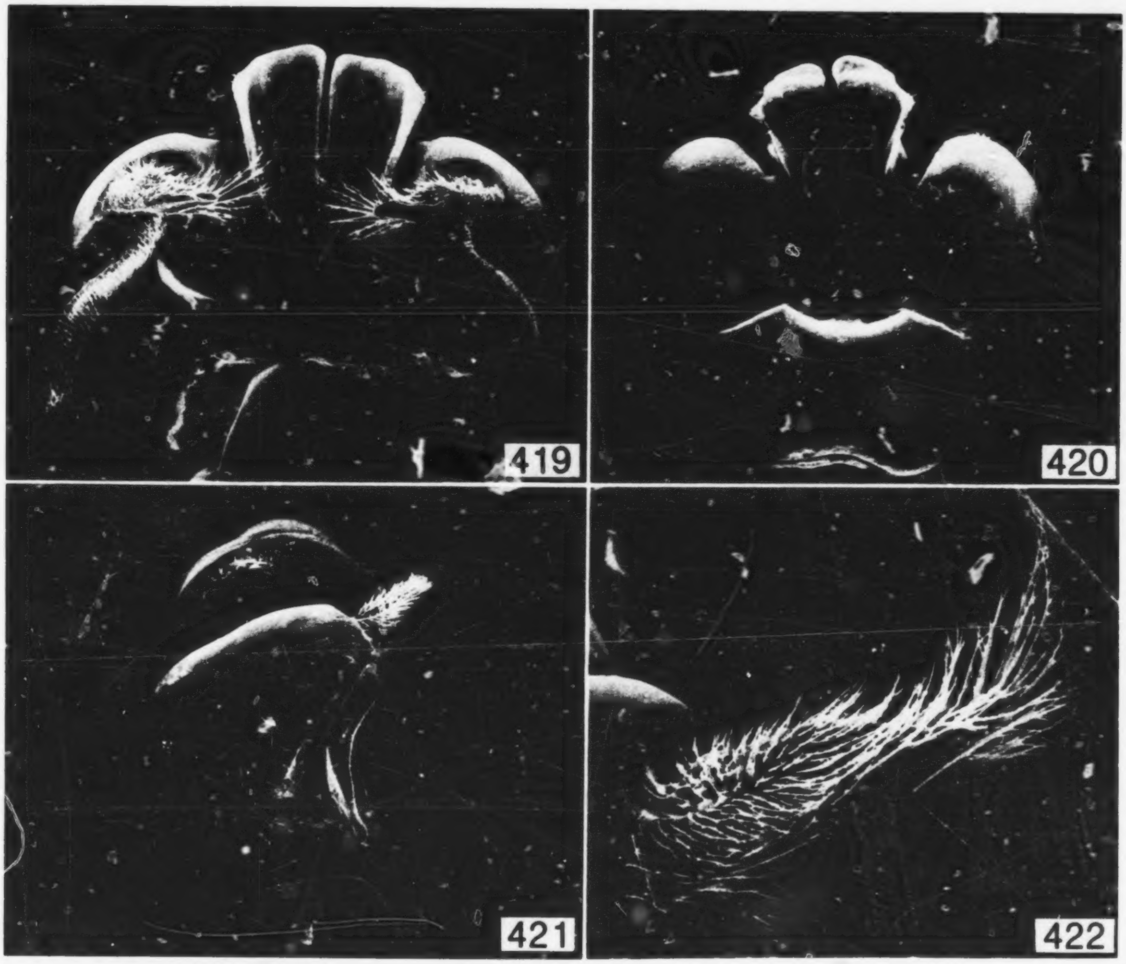
Specimens Examined.—Paratypes (77♀, 21♂).

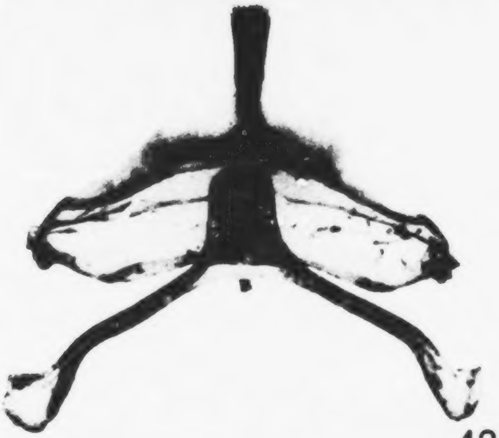
CANADA. New Brunswick: *Albert Co.:* Albert Mines, W of, #567, taken on *Vaccinium* sp., 17-VI-77, P.G. Kevan, C. Holmes (1♀; INHS); Elgin, SW of, #581, taken on *Vaccinium* sp., 17-VI-77, P.G. Kevan, C. Holmes (1♀; INHS); Prosser Brook, S of, #426, taken on *Vaccinium* sp., 17-VI-77, P.G. Kevan, C. Holmes (1♀; INHS). *Charlotte Co.:* Honeydale, 3 mi SE, #22, 14-IV-74, Peter G. Kevan (1♀; INHS). *Kings Co.:* Hatfield Point, NE of, 17-VI-75, #138, P.G. Kevan, C. Holmes (1♀; INHS); Kingston, N of, #106, 119, 2-VI-76, Peter G. Kevan (2♀; INHS); Pigeon Hill, SW of Springfield, #53, 8-VI-1973, Peter G. Kevan (1♀; INHS); Springfield, SW of, #146, taken on *Vaccinium* sp., 16-VI-77, Peter G. Kevan, C. Holmes (1♀; INHS); West Scotch Settlement (N of Hatfield Point), #23, VI-9-1973, Peter G. Kevan (1♀; INHS). *Queens Co.:* Thorne (N of Belleisle Creek), #97, 9-VI-73, Peter G. Kevan (1♀; INHS). *Westmorland Co.:* Goshen, SW of, #248, 3-VI-76, Peter G. Kevan (1♀; INHS); Parkindale, SW of, #327, 329, 3-VI-76, Peter G. Kevan (2♀; INHS). *County not specified:* Kouchibouguac N.P., Code 5081K, 19-V-77, G.A.P. Gibson (1♀; CNC), Code 5172A, 30-V-77, G. Thompson (1♀, CNC), Code 6045M, 7-IX-77, S.J. Miller (1♂; CNC). Nova Scotia. *Hanks Co.:* locality not specified, on *Prunus,* 12 Jun 1932, C.E. Atwood (1♀; USNM). Ontario. Kenora, 17 mi SE, 3 Aug 1967, J.R. Powers (1♀; UCB), 23 mi SE, sweeping flowers of *Melilotus alba,* 4 Aug 1967, J.R. Powers (1♀; UCB). Quebec. L'Ascension, VI-11-63, L.J. Jobin (1♀; CNC).

UNITED STATES. Connecticut: [*Litchfield Co.:*] Colebrook, W.M. Wheeler (3♀, 1♂; MCZ), 6-13-26, W.M. Wheeler (1♀; MCZ). Maine: *Knox Co.:* Glenmere, W.M. Wheeler (1♀; MCZ). [*Lincoln Co.:*] Waldoboro, #3247, on *Acer saccharinum,* 11 May 1905, J.H. Lovell (1♀; AMNH). Massachusetts: [*Barnstable Co.:*] Sagamore, J. Bequaert (1♀; MCZ). [*Bristol Co.:*] Horseneck Beach, Westport, 29 Jul 1930, Richard Dow (1♂; MCZ). [*Middlesex Co.:*] Lexington, 13 Aug, N. Banks (1♀; MCZ); Reading, 17-VI-33, (1♀; MCZ); Waltham, on *Taraxacum offinale,* 7-V-75, 8-V-57 (2), 14-V-57, R.A. Morse (4♀; CU). *Norfolk Co.:* Sharon, 25-VIII, C.W. Johnson (1♂; MCZ). [*Suffolk Co.:*] Milton, 20 Aug 1898 (second label reads "*H.* sp. near *coriaceus,* tarsi pale") (1♂; MCZ). [*Worcester Co.:*] Winchendon, 1 Jul 1892, A.P. Morse (1♀; MCZ). *County not specified:* Petersham [?], VI-1932 (1♀; MCZ).

Michigan: *Cheboygan Co.:* Duncan Bay, 27 Ju[n] 1958, 2 Jul 1958 [latter specimen only with R.A. Kepner collector label] (2♀; MSUEL); [*Cheboygan Co.:*] Douglas Lake, on *Solidago,* Ac. 23702, 17 Aug 1913, M.D. Ellis (1♂; AMNH); UMBS, Douglas Lake, summer 1960, Saul Frommer (1♀; UCR); locality not specified, VII-10-1959, R. & K. Dreisbach (1♀; MSUEL). *Crawford Co.:* locality not specified, VII-10-1959, R. & K. Dreisbach (1♀; MSUEL). *Delta Co.:* Escanaba, 28 Jun 1958, R.A. Scheibner (1♀; MSUEL). *Dickinson Co.:* locality not specified, 6-22-60, R. & K. Dreisbach (1♀; MSUEL). *Emmet Co.:* 5-27-60, R. & K. Dreisbach (1♀; MSUEL). *Huron Co.:* T18N, R11E, Sec. 21, VI-20-63, J. & L. Donahue (1♀; MSUEL). *Mackinac Co.:* locality not specified, 6-7-57, R. & K. Dreisbach (1♀; MSUEL). [*Mecosta Co.:*] Big Rapids, on wild rose, VI-5-1938, C.W. Sabrosky (3♀; MSUEL). *Missaukee Co.:* 6-30-57, R. & K. Dreisbach (1♀; MSUEL). *Newaygo Co.:* locality not specified, 5-13-56, R. & K. Dreisbach (1♀; MSUEL). *Ogemaw Co.:* Clear Lake, 3 Sep 1959, R.L. Fisher (1♀; MSUEL). *Oscoda Co.:* Luzerne, ex. window pane trap, 14 Jun 1966 (1), 28 Jun 1966 (7), L.F. Wilson (8♀; MSUEL). *Presque Isle Co.:* T33N, R11E, Sec. 33, 19 Jun 1968, N. & T. Baker (1♀; MSUEL). *Wexford Co.:* T24N, R9W, Sec. 22, pit trap in Jack pine plantation, 2–9 Aug 1965, J.H. Shaddy (1♀; MSUEL).

New Hampshire: Belknap Co.: locality not specified, on *Aster macrophyllus,* 23-VIII-60 (2), 26-VIII-60 (2), R.A. Morse (4♂; CU); [*Belknap Co.:*] Meredith Center, on *Rubus* sp., 23-VI-58, R.A. Morse (1♀; CU), on *Apocynum adrosaemifolium,* 4-VII-58, R.A. Morse (1♀; CU), on *Brassica* sp., 1-VII-59, R.A. Morse (1♀; CU), on *Solidago* sp., 3-VIII-57, R.A. Morse (1♂; CU); Meredith, on *Aster lateriflorus,* 28-





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FIGURES 419–423.—*Lasioglossum acuminatum*, male: 419, genitalia, ventral view; 420, same, dorsal view; 421, same, lateral view; 422, gonostylus; 423, sterna VII–VIII.

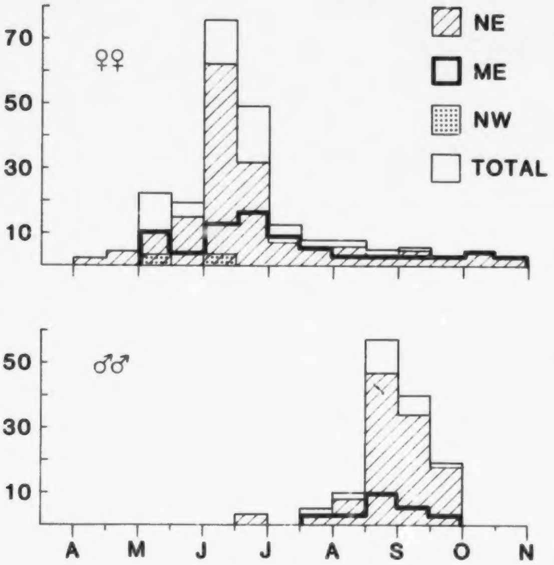


FIGURE 424.—*Lasioglossum acuminatum* flight records.

VIII-60, R.A. Morse (1♂; CU), on *Asclepias* sp., 7-VIII-60, R.A. Morse (1♂; CU), on *Solidago* sp., 18-VIII-62 (1), 22-VIII-60 (2), 23-VIII-60 (1), R.A. Morse (4♂; CU). *County not specified:* #1864, C.F. Baker (1♀ USNM). NEW JERSEY: *Burlington Co.:* Lebanon St.[ate] Forest, VIII-19-58, Evans & Beneway (1♂; CU); Lebanon St.[ate] Forest, 4 mi N Chatsworth, 5 May 1968, G.C. Eickwort (1♀; CU). *Ocean Co.:* Lakehurst, 10 May 1969, G. & K. Eickwort (1♀; CU), 21-VIII-1974, R.C. Miller (1♂; CU); Long Beach Is[land], washed ashore beach alive, 5 May 1968, G. & K. Eickwort (1♀; CU). NEW YORK: *Nassau Co.:* Bethpage St.[ate] P[ar]k., 20 May 1975, G.C. Eickwort (1♀; CU). [*Suffolk Co.:*] Orient, 19 Jun 1954, Roy Latham, Roy Latham Collection (1♀; CU); Wading River, L.[ong] I.[sland], Stanford University [Collection], 22 Jun 1917 (1♀; UCB). *Sullivan Co.:* Yankee Lake, 20–26 Jul 1968, P. & R. Wygodzinsky (1♀; AMNH). *County not specified:* Tuxedo (Sta. Study Insects), VI-27-1928, C.H. Curran (1♀; AMNH); Tuxedo, n[ea]r., VIII-26-21 (2♂; AMNH).

PENNSYLVANIA: *Huntingdon Co.:* Huntingdon, 3 mi NE, 25 Jun 1973, T. Snyder (1♀; KU). [*Monroe Co.:*] Marshall Cr[eek]., VII-25-37, C.D. Michener (1♀; KU). *Pike Co.:* locality not specified, 11-VI-71, C. Jurica, M. Burgett (1♀; CU). *County not specified:* Lehigh Gap, VI-29-1901 (1♀; USNM).

Additional localities recorded (363 specimens: 250♀, 113♂).

CANADA. ALBERTA: Fawcett; Calgary. NEW BRUNSWICK: *Albert Co.:* Collier Mt. (south of Prosser Brook); *Charlotte Co.:* Moores Milles, St. Stephen, 5 mi W; *Kings Co.* NOVA SCOTIA: *Hants Co.; Kings Co.* ONTARIO: Bancroft; Bracebridge; Dorset; Dyer Bay; Garden River; Gravenhurst; Hornet Lake; Kenora (15 mi SE); Penage Lake; Vivian Forest. QUEBEC: Andreville (3 mi E Route 6).

UNITED STATES. CONNECTICUT: *Tolland Co.:* Mansfield Township (Gurleyville). MAINE: *Cumberland Co.:* Bailey Island; *Hancock Co.:* Acadia National Park; *Lincoln Co.; Washington Co.:* Jonesboro; *York Co.:* Kennebunk. MARYLAND: *Prince George's Co.:* Bowie. MASSACHUSETTS: *Barnstable Co.:* Nashawena Island (Elizabeth Islands); *Dukes Co.:* Plains (Martha's Vineyard); *Hampden Co.:* Ludlow; *Middlesex Co.; Norfolk Co.:* Needham, Wellesley; *Suffolk Co.:* Boston, Forest Hills; *Worcester Co.:* Holden. MICHIGAN: *Allegan Co.:* Allegan State Forest; *Berrien Co.; Kalkaska Co.; Leelanau Co.:* Glen Arbor; *Manistee Co.:* Manistee; *Marquette Co.:* Marquette; *Midland Co.; Montmorency Co.:* Atlanta; *Presque Isle Co.:* Ocqueoc Lake; *Roscommon Co.* MINNESOTA. *Cass Co.:* Pine River; *Clearwater* or *Hubbard Co.:* Itasca State Park. NEBRASKA: Bennett. NEW HAMPSHIRE: *Sullivan Co.:* Lempster. NEW JERSEY: *Burlington Co.; Ocean Co.:* Lakewood, Point Pleasant, Whiting, 3.8 mi W. NEW YORK: *Albany Co.:* Albany; *Essex Co.; Franklin Co.:* Saranac Lake; *Orange Co.:* Greenwood Lake; *Suffolk Co.* PENNSYLVANIA: counties not specified. *West Virginia: Tucker Co.:* near Davis. WISCONSIN: *Douglas Co.:* Solon Springs; *Wood Co.:* Griffith State Nursery.

19. *Lasioglossum forbesii* (Robertson)

FIGURES 406, 408, 425–433

Halictus Forbesii Robertson, 1890:315 [female, male].

Halictus forbesii.—Robertson, 1894 [emendation, flower records].—Cockerell, 1897:163 [flower and locality records]; 1898c:51 [taxonomic notes]; 1906:294 [locality record].—Graenicher, 1907 [flower records]; 1909 [flower records].—Cresson, 1928:60 [lectotype designation].

Lasioglossum forbesii.—Robertson, 1902:247 [key].—Michener, 1951:1106 [Nearctic catalog].—Evans, 1955:47 [predator, *Philanthus sanbornii* Cresson].—Mitchell, 1960:342 [redescription, key].—Knerer and Atwood, 1962:163 [nest, locality and flower records]; 1967:104 [conopid parasitoid].—Hurd, 1979:1957 [Nearctic catalog].

Curtisapis forbesii.—Robertson, 1918:91 [taxonomic notes]; 1929 [flower records].

Halictus forbesi.—Michener, 1951:1106.—Hurd, 1979: 1957 [lapsus calami].

TYPE MATERIAL.—The female lectotype of *Halictus forbesii,* designated by E.T. Cresson (1928), is deposited in the Academy of Natural Sciences at Philadelphia. The specimen is in excellent condition and is labeled

Robertson S.[outhern] Illinois/LectoTYPE 4257 [red label]/Halictus Forbesii Rob.[ertson] [handwritten].

I have not examined the other three females and two males from Robertson's original series; they are presumably also in Philadelphia.

Distribution (Figure 406).—Although *Lasioglossum forbesii* is partly sympatric with *L. acuminatum* and *L. paraforbesii* it has the most southern distribution among species of the *forbesii* group. It is found from New York to Wisconsin and south to Oklahoma, Arkansas, and North Carolina.

Diagnosis.—The hair fringe that surrounds the glabrous central area of the acarinarium on the anterior surface of tergum I is distinctively formed in *L. forbesii*. The elongate fringe hairs extend laterally on the tergal surface and form an extensive and thick hair patch with a distinctly transverse dorsal margin (Figure 408). The dorsal opening of the acarinarial hair fringe is extremely narrow, much more so than that of *L. paraforbesii* (Figure 409). The acarinarium of *L. acuminatum*, the other species in the *forbesii* group, is uniquely arrow-shaped (Figure 407). Other characters helpful in recognizing *L. forbesii* are the short head (Figure 425, length/width ratio x̄ = 0.89, n = 20; head longer in *L. paraforbesii*, Figure 434, x̄ = 0.92, n = 20) and the sharply-edged, posterolateral edges of the dorsal propodeal surface (this was mentioned in Robertson's original description).

Among *forbesii* group males (see above diagnosis of the *forbesii* group) the males of *L. forbesii* cannot reliably be separated from those of *L. paraforbesii*. *Lasioglossum forbesii* males have wider heads than those of the latter species (Figure 426, length/width ratio x̄ = 0.90, n = 20; compare with Figure 435, x̄ = 0.93, n = 20) but this character is at best difficult to work with. The extremely elongate mandibles of *L. acuminatum* males (Figure 411) will differentiate them from the above species.

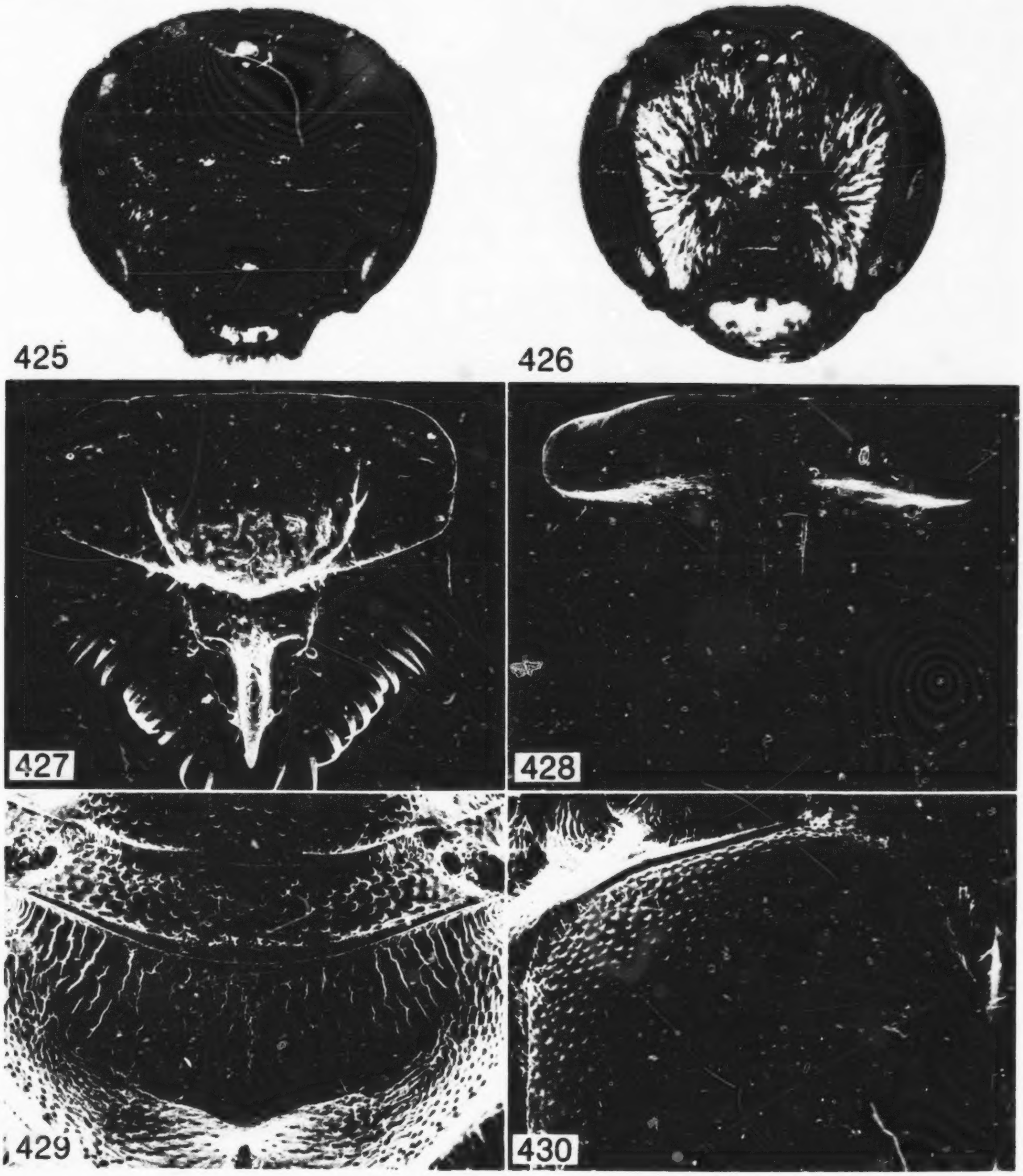
Description.—female: (1) Length 7.0–9.4 mm (x̄ = 8.5, n = 20); (2) wing length 2.1–2.8 mm (x̄ = 2.5, n = 20); (3) abdominal width 2.4–3.1 mm (x̄ = 2.7, n = 20).

Structure: (4) Head short (Figure 425; length/width ratio 0.83–0.96, x̄ = 0.89, n = 20). (7) Supraclypeal area evenly rounded, (8) moderately protuberant. (9) Clypeus projecting approximately 0.64 of its length below lower margin of eyes; (11) surface without median longitudinal sulcation. (14) Distance between lateral ocelli subequal to distance between lateral ocellus and eye. (23) Flagellomere 1 slightly shorter than 2 along dorsal surface. Labrum as in Figure 427; (27) distal keel moderately narrow as seen in frontal view, lateral edges slightly bowed; (28) distal lateral projections weakly developed, rounded; (29) some fimbrial setae bluntly rounded.

(32) Pronotal lateral angle broadly obtuse; (33) pronotal lateral ridge incomplete, interrupted by oblique lateral sulcus; (34) lower portion of lateral ridge sharply edged. (35) Mesoscutal lip weakly bilobed, (36) moderately elevated from pronotum. (40) Dorsal surface of propodeum about 0.82 the length of scutellum and about 1.6 times the length of metanotum, (41) slightly depressed centrally, (42) posterior margin broadly rounded; (43) propodeal triangle moderately well defined, evident medially as a *V*-shaped elevation with sharply-edged lateral rims, fading towards metanotum; (44) lateral carinae extending at most half the length of posterior surface. (45) Tibial spur similar to Figure 46.

(46) Lateral edge of metasomal tergum II moderately sinuate.

Sculpture: (47) Face shiny, (48) punctures moderately dense below ocelli, separated by at most their width, becoming less dense near antennae. (51) Supraclypeal area weakly granulate, (51) uniformly punctate, punctures separated by 1–2 times their width. (53) Clypeus polished; (54) punctures separated by their width basally, becoming less dense apically and apicolaterally. (56) Mesoscutum moderately shiny; (57) punctation as in Figure 430, punctures separated by their width or less laterally and anteriorly, less dense centrally, punctures 1–4 times their width apart.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FIGURES 425–430.—*Lasioglossum forbesii:* 425, female head; 426, male head; 427, female labrum; 428, male labrum; 429, female propodeum; 430, female mesoscutum.

(58) Scutellum very sparsely punctate adjacent to median line, punctures 2–3 times their width apart. (63) Dorsal surface of propodeum (Figure 429) ruguloso-striate laterally, rugulose medially; (64) surface alveolated. (65) Metasomal tergum I moderately shiny; (66) punctation fine, dense, punctures slightly less than their width apart.

Coloration: (71) Wing membrane pale yellowish brown.

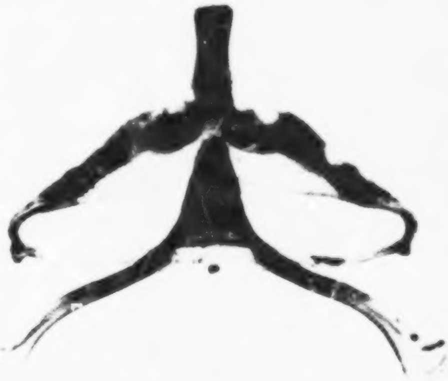
Vestiture: (74) Pubescence of head white. (75) Pubescence of thorax white; (76) mesoscutal hairs moderately sparse and plumose. (77) Hind tibial hairs concolorous, yellowish brown. (78) Anterior hairs of metasomal tergum I and (76) basal hair bands of terga II–IV white. (80) Acarinarium present (Figure 408), a very small circular, glabrous area surrounded laterally and dorsally by elongate fringe hairs, dorsal fringe hairs forming a straight-edged acarinarial border; opening of acarinarium extremely narrow, width of opening approximately one-third the width of lateral fringe hairs as seen in dorsal view.

MALE: Similar to female except as follows: (1) length 6.7–8.6 mm (x̄ = 7.5, n = 20); (2) wing length 1.9–2.3 mm (x̄ = 2.0, n = 20); (3) abdominal width 1.7–2.1 mm (x̄ = 1.9, n = 20). (4) Head as in Figure 426 (length/width ratio 0.85–0.95, x̄ = 0.88, n = 20). (5) Gena subequal to eye in width, (6) moderately produced posteriorly. (10) Clypeal surface shallowly depressed ventrally. Labrum as in Figure 428; (24) distal process weakly developed, slightly projecting but not acutely pointed as in *L. acuminatum* and *L. paraforbesii;* (25) basal area depressed medially; (26) basal lateral depressions absent. (30) Mandible short, just reaching opposing clypeal angle. (53) Clypeus polished; (54) punctures well formed and dense basally, very fine and scattered over apical two-thirds. (68) Clypeal maculation present (Figure 426). (69) Flagellum pale yellowish orange ventrally, contrasting with dark dorsum. (72) Tarsi yellow to yellowish orange.

Vestiture: Sternal vestiture as in Figures 416, 417; (82) hairs on sternum IV erect, elongate, becoming shorter laterally; (83) sternum V with some inconspicuous erect hairs but without noticeable hair patterns or lobes.

Terminalia: Sterna VII–VIII as in Figure 431; (85) sternum VIII with elongate, slender median process, slightly broader apically than along stem. Genitalia similar to Figures 419–422; (86) gonobase moderately elongate; (87) gonostylus elongate, moderately slender, tapering to acute apex (Figure 432, more slender than that of *L. acuminatum*); (89) retrorse membranous lobe extremely slender; (90) volsella with prominent lateral lobe.

FLIGHT RECORDS (Figure 433).—Females of *L. forbesii* have been collected from late March



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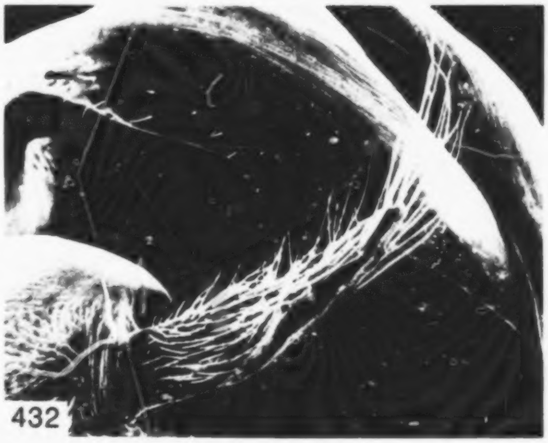

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FIGURES 431, 432.—*Lasioglossum forbesii,* male: 431, sterna VII-VIII; 432, gonostylus.

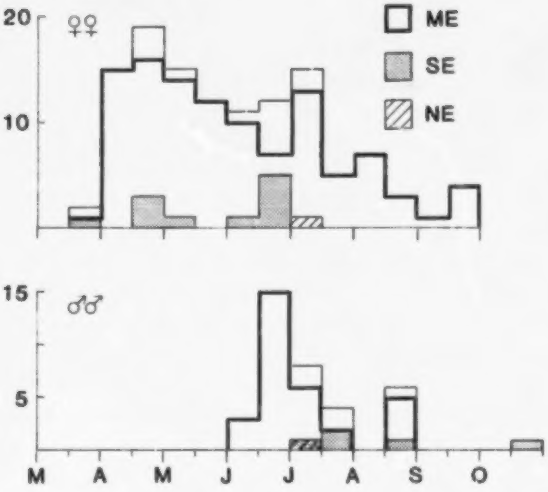


FIGURE 433.—*Lasioglossum forbesii* flight records (outer line = total).

(one female from southern Illinois and the other from Raleigh, North Carolina) through September, with a peak in late April. Males have been taken from June to August, with one record from late October (Black Mountains, North Carolina).

FLOWER RECORDS.—Females (45): Rosaceae 29%; Leguminosae 16%; Salicaceae 13%. Males (9): Leguminosae 50%. Total: 54 in 14 families, 20 genera as follows:

**Amorpha* 3(1)♀; *Apocynum* 1♂; *Ceanothus* 1♀, 2♂; *Cercis* 1♀; *Claytonia* 2♀; *Galax* 1♀; *Houstonia* 1♀; *Hydrangea* 1♂; *Koellia* 1♂; **Melilotus* 6(1)♀, 4♂; **Prunus* 4(2)♀; *Rhamnus* 3♀; **Rhus* 4(3)♀; **Rubus* 7(7)♀; *Salix* 6♀; **Senecio* 1(1)♀; *Spireu* 2♀; *Taraxacum* 1♀; *Thaspium* 1♀; *Vitex* 1♀.

SPECIMENS EXAMINED.—196 (147♀, 49♂).

UNITED STATES. ARKANSAS: *Cleburne Co.; Marion Co.* DISTRICT OF COLUMBIA. ILLINOIS: *Champaign Co.:* Urbana. INDIANA: *Posey Co.:* Mt. Vernon, 2 mi E, 5 mi S; *Tippecanoe Co.* KANSAS: *Anderson Co.:* Garnett; *Dickinson Co.; Douglas Co.; Miami Co.; Pottawatomie Co.:* Little Gobi Desert; *Riley Co.:* Manhattan, Marlatt. MICHIGAN: *Clinton Co.:* Grand Ledge; *Ingham Co.:* East Lansing. MISSOURI: *Boone Co.:* Columbia; *Dallas Co.:* Buffalo; *Franklin Co.:* Missouri Botanical Garden Arboretum (Gray Summit); *Greene Co.:* Atherton, Willard; *Howell Co.:* Willow Springs; *St. Louis Co.:* St. Louis; *Shannon Co.:* Round Springs. NEBRASKA: *Lancaster Co.:* Lincoln. NEW JERSEY: *Burlington Co.:* Medford Lakes. NEW YORK: *Rensselaer Co.:* Brainard; *Suffolk Co.:* Fire Island. NORTH CAROLINA: *Allegheny Co.:* Scenic Highway; *Avery Co.:* Grandfather Mt.; *Macon Co.:* Highlands; *McDowell Co.:* Marion; *Wake Co.:* Raleigh. OHIO: *Clark Co.:* Springfield; *Franklin Co.:* Columbus; *Highland Co.; Hocking Co.; Ottawa Co.:* Put-In-Bay; *Ross Co.* OKLAHOMA: *Payne Co.:* Stillwater, 3 mi E. PENNSYLVANIA: *Fayette Co.:* Uniontown; *Westmoreland Co.* VIRGINIA: *Arlington Co.:* Glencarlyn; *Fairfax Co.:* Falls Church; *Montgomery Co.:* Blacksburg. WEST VIRGINIA: *Randolph Co.:* Cheat Mt. WISCONSIN: *Crawford Co.:* Gays Mills; *Dane Co.:* Belleville, Eagle Heights; *Lafayette Co.; Waushara Co.:* Wild Rose.

20. *Lasioglossum paraforbesii*, new species

FIGURES 46, 406, 434–442

TYPE MATERIAL.—The female holotype of *L. paraforbesii* is deposited in the National Museum of Natural History, Smithsonian Institution. It is in excellent condition and is labeled

SOUTH DAKOTA Hardy W.[ork] C.[enter] T3N,R1E,S30 [extreme southwest corner of Lawrence County, southwest of Cheyenne Crossing on Route 85] 2-July 1965 R.W. Hodges/HOLOTYPE Lasioglossum paraforbesii R.J. McGinley [red label].

One hundred paratypes (80♀, 20♂) listed in the "Specimens Examined" section are designated.

DISTRIBUTION (Figure 406).—*Lasioglossum paraforbesii* is the most common and widespread species in the *forbesii* group and one of the commonest species throughout much of the eastern and central United States. It is found from New Brunswick to Alberta and Idaho and south to central New Mexico, Nebraska, Illinois, Ohio, and northern Virginia.

DIAGNOSIS.—Among species of the *forbesii* group (see introductory diagnosis to the group) the females of *L. paraforbesii* can be distinguished by the structure of the acarinarium on the anterior surface of tergum I (Figure 409). The glabrous central area of the acarinarium is circular, not arrow-shaped as is that of *L. acuminatum* (Figure 407), and the hair fringe surrounding the glabrous area has a wide dorsal opening, the width of which is nearly subequal to that of the lateral hair fringe as seen from above (this opening is extremely narrow in *L. forbesii*, Figure 408). Females of *L. paraforbesii* lack the sharply edged posterolateral margins of the dorsal propodeal surface typical of *L. forbesii* and have longer heads than the latter species (Figure 434, length/width ratio $\bar{x} = 0.92$, $n = 20$; compare with Figure 425, $\bar{x} = 0.89$, $n = 20$).

The males of *L. paraforbesii* cannot be reliably separated from those of *L. forbesii* (see introductory diagnosis for the species group and the "Diagnosis" section for *L. forbesii*).

DESCRIPTION.—FEMALE: (1) Length 7.2–10.4 mm ($\bar{x} = 9.1$, $n = 20$); (2) wing length 2.3–2.9 mm ($\bar{x} = 2.6$, $n = 20$); (3) abdominal width 2.3–3.2 mm ($\bar{x} = 2.9$, $n = 20$).

Structure: (4) Head moderately short to moderately elongate (Figure 434; length/width ratio 0.82–0.96, $\bar{x} = 0.92$, $n = 20$). (7) Supraclypeal area evenly rounded, (8) moderately protuberant. (9) Clypeus projecting approximately 0.74 of its length below lower margin of eyes; (11) surface without median longitudinal sulcation. (14) Distance between lateral ocelli subequal to distance between lateral ocellus and eye. (23) Flagellomere 1 subequal in length to 2 along dorsal surface. Labrum as in Figure 436; (27) distal keel moderately broad as seen in frontal view, lateral edges evenly bowed; (28) distal lateral projections somewhat weakly developed, rounded; (29) some fimbrial setae bluntly rounded.

(32) Pronotal lateral angle broadly obtuse; (33) pronotal lateral ridge incomplete, interrupted by oblique lateral sulcus; (34) lower portion of lateral ridge sharply edged. (35) Mesoscutal lip weakly bilobed, (36) moderately elevated from pronotum. (40) Dorsal surface of propodeum about 0.73 the length of scutellum and about 1.4 times the length of metanotum, (41) slightly depressed centrally, (42) posterior margin broadly rounded; (43) propodeal triangle weakly defined laterally, evident medially as a V-shaped elevation with low lateral rims; (44) lateral carinae extending less than half the length of posterior surface. (45) Tibial spur as in Figure 46.

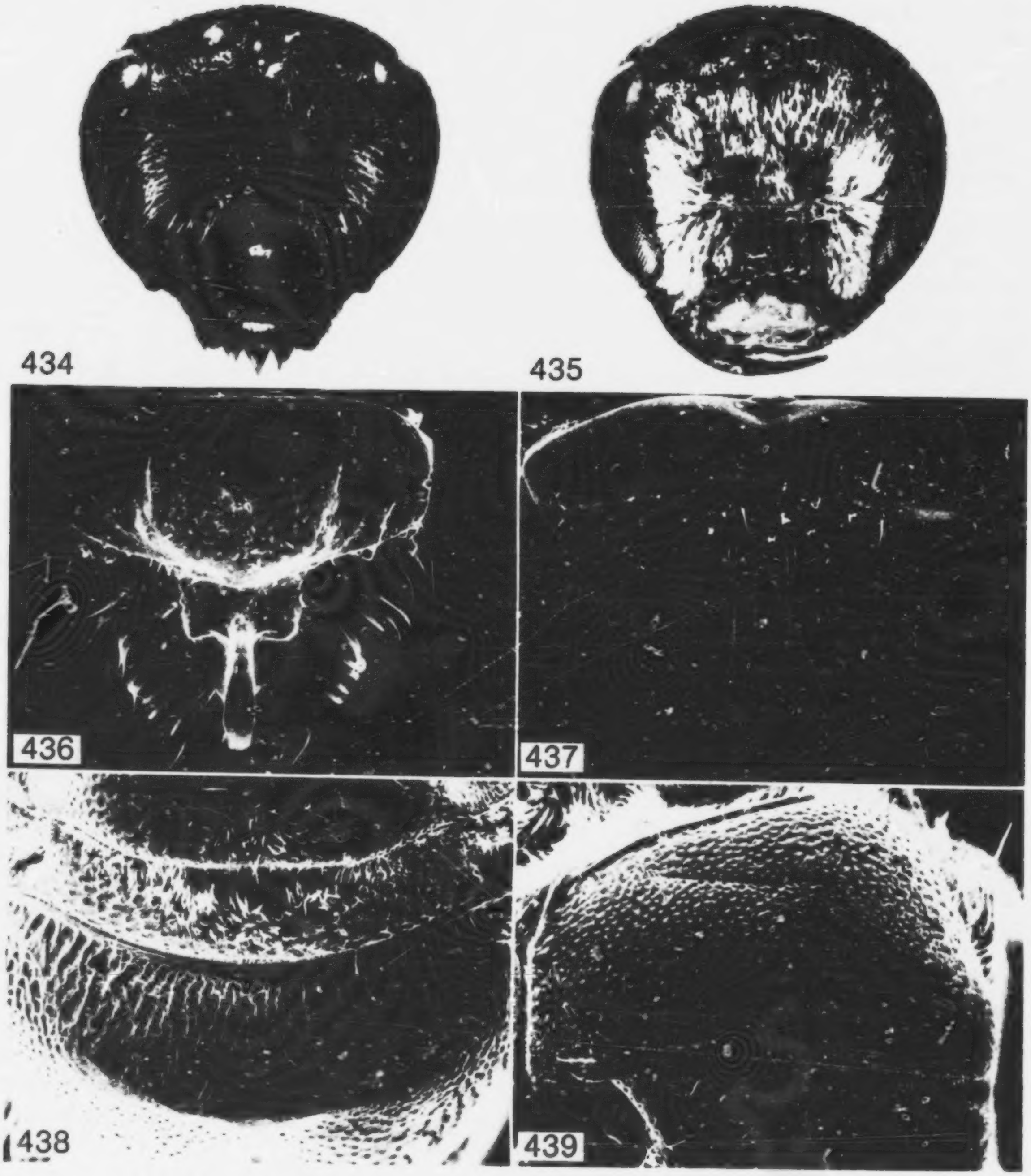
(46) Lateral edge of metasomal tergum II weakly sinuate, nearly straight.

Sculpture: (47) Face shiny, (48) densely punctate below ocelli, punctures contiguous, becoming larger and less dense near antennae. (51) Supraclypeal area polished, (51) punctures separated by 1–2 times their width laterally, becoming sparse centrally. (53) Clypeus polished; (54) punctures separated by their width basally, apical one-third virtually impunctate. (56) Mesoscutum shiny; (57) punctation as in Figure 439, punctures separated by their width or less laterally and anteriorly, less dense centrally, punctures 1–3 times their width apart. (58) Scutellum very sparsely punctate adjacent to median line with conspicuous impunctate areas. (63) Dorsal surface of propodeum (Figure 438) ruguloso-striate over basal two-thirds, posterior one-third smooth or obscurely striolate; (64) surface alveolated. (65) Metasomal tergum I moderately shiny; (66) punctation fine, dense, punctures slightly less than their width apart.

Coloration: (71) Wing membrane pale yellowish brown.

Vestiture: (74) Pubescence of head white. (75) Pubescence of thorax white to pale yellowish brown, white on pronotal lateral angle, pronotal lobe and metanotum; (76) mesoscutal hairs moderately sparse and plumose. (77) Hind tibial hairs concolorous, yellowish brown. (78) Anterior hairs of metasomal tergum I white to yellowish white, (79) basal hair bands of terga II–IV white. (80) Acarinarium present (Figure 409), a relatively small, circular, glabrous area surrounded laterally by elongate fringe hairs, dorsal opening of acarinarium moderately wide, width of opening slightly exceeded by width of lateral hair fringe as seen in dorsal view.

MALE: Similar to female except as follows: (1) length 6.9–9.0 mm ($\bar{x} = 8.0$, $n = 20$); (2) wing length 1.8–2.3 mm ($\bar{x} = 2.6$, $n = 20$); (3) abdominal width 1.8–2.3 mm ($\bar{x} = 2.1$, $n = 20$). (4) Head as in Figure 435 (length/width ratio 0.88–0.96, $\bar{x} = 0.93$, $n = 20$). (5) Gena subequal to eye in width, (6) moderately produced posteriorly. (10) Clypeal surface nearly flat, only faintly depressed ventrally. Labrum as in Figure 437; (24) distal process weakly developed as a short, acute projection; (25) basal area depressed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FIGURES 434–439.—*Lasioglossum paraforbesii:* 434, female head; 435, male head; 436, female labrum; 437, male labrum; 438, female propodeum; 439, female mesoscutum.

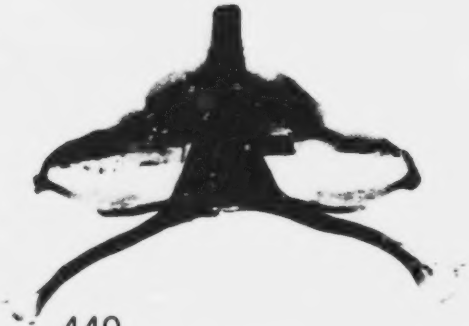
medially; (26) basal lateral depressions absent. (30) Mandible moderately elongate, reaching slightly beyond opposing clypeal angle. (53) Clypeus polished; (54) punctures well formed and dense basally, very fine and scattered over apical two-thirds. (68) Clypeal maculation present (Figure 435). (69) Flagellum light brown ventrally, contrasting with dark dorsum. (72) Tarsi yellow to yellowish orange.

Vestiture: Sternal vestiture as in Figures 416, 417; (82) hairs on sternum IV erect, elongate, becoming shorter laterally; (83) sternum V with some inconspicuous erect hairs but without noticeable hair patterns or lobes.

Terminalia: Sterna VII–VIII as in Figure 440; (85) sternum VIII with moderately elongate, parallel-sided median process. Genitalia as in Figure 441; (86) gonobase moderately elongate (same as *L. forbesii* for other characters).

FLIGHT RECORDS (Figure 442).—*Lasioglossum paraforbesii* females have been collected from April through October. Of these records, 63% come from May and June, with a definite peak in May for specimens from the middle-eastern and southwestern regions. Females from the northwestern region peak in late June. Males have been taken from June through October, with 66% of the records coming from July and August.

FLOWER RECORDS.—Females (372): Rosaceae 46%; Compositae 13%. Males (42): Compositae



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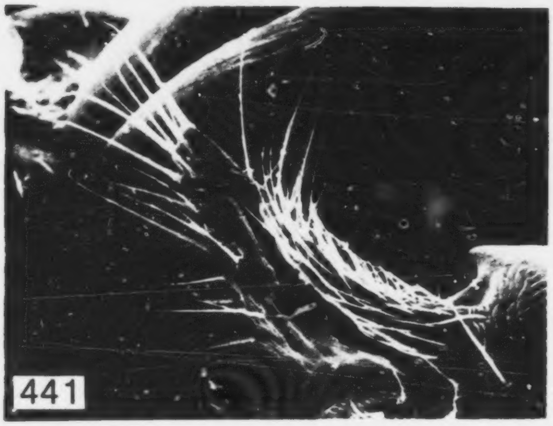


FIGURES 440, 441.—*Lasioglossum paraforbesii*, male: 440, sterna VII–VIII; 441, gonostylus.

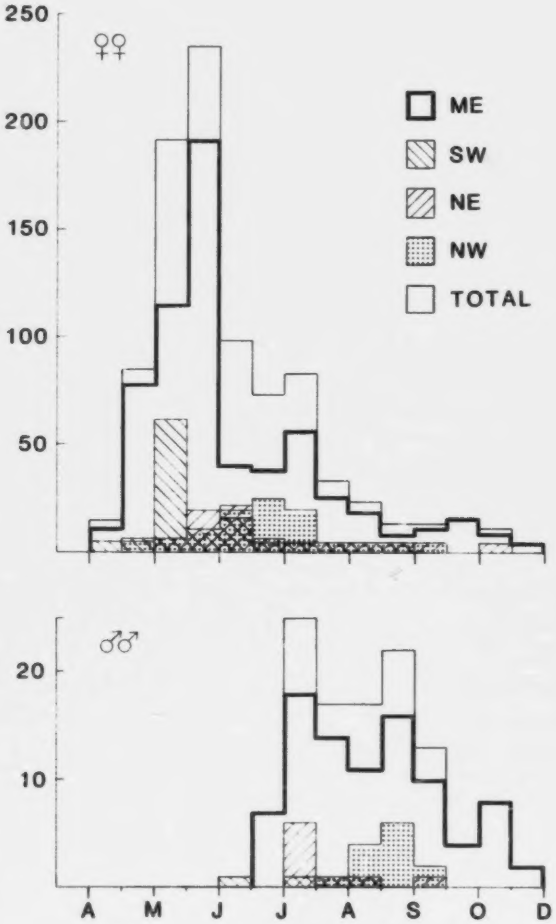


FIGURE 442.—*Lasioglossum paraforbesii* flight records.

40%; Leguminosae 38%. Total: 414 in 24 families, 65 genera as follows:

Allonia 2♀; **Amelanchier* 5(2)♀; **Amorpha* 6(3)♀; *Anemone* 1♀; *Asclepias* 1♀; *Aster* 2♀, 2♂; *Atriplex* 2♀; *Bidens* 6♀; **Brassica* 11(4)♀; **Camassia* 6(5)♀; **Ceanothus* 11(1)♀; *Centaurea* 3♂; *Chrysanthemum* 1♀; *Cichorium* 1♀; **Cirsium* 3(2)♀; **Cornus* 9(9)♀; **Crataegus* 3(1)♀; *Cymopterus* 1♀; **Dracocephalum* 2(2)♀; **Erigeron* 3(2)♀; *Eryngium* 1♀; *Euphorbia* 1♀; *Geranium* 1♀; *Grindelia* 1♀, 2♂; *Helianthus* 1♂; *Iva* 1♀; **Lepidum* 1(1)♀; *Lonicera* 2♀; *Medicago* 6♀, 5♂; **Melilotus* 10(2)♀, 11♂; **Mirabilis* 1(1)♀; **Pentstemon* 1(1)♀; **Petalostemon* 5(4)♀; *Physalis* 1♀; *Physostegia* 1♂; *Platycodon* 1♂; *Potentilla* 1♀; **Prunus* 119(54)♀; **Pyrus* 30(1)♀; **Rhododendron* 1(1)♀; *Rhus* 3♂; **Ribes* 6(5)♀; **Rosa* 5(4)♀; *Rubus* 13♀, 1♂; *Rudbeckia* 1♂; **Salix* 36(5)♀; *Sambucus* 1♂; *Sanicula* 1♀; *Scrophularia* 1♀; *Senecio* 1♀; *Sisymbrium* 2♀; **Solanum* 1(1)♀; *Solidago* 1♀, 3♂; **Spirea* 4(4)♀; *Symphoricarpus* 1♀, 1♂; **Syringa* 2(2)♀; **Taraxacum* 30(11)♀; 5♂; *Thalspi* 1♀; *Trifolium* 1♀; *Vaccinium* 2♀; *Verbena* 2♀, 1♂; *Viburnum* 2♀; **Vicia* 1(1)♀.

SPECIMENS EXAMINED.—Paratypes (80♀, 20♂).

CANADA. ALBERTA: Calgary, V-7-1928, O. Bryant (3♀; CAS); Medicine Hat, 24-IV-26, F.S. Carr (1♀; CAS); Onefour, 1-IV-1956, E.E. Stearns (2♀; CNC), 3-VI-1956, E.E. Stearns (1♀; CNC). MANITOBA: Aweme, 14-V-1925, 27-VI-1925, R.D. Bird (2♀; CNC), 28-VIII-1914, N. Criddle (1♂; CNC); Carberry, 16 Jun 1953, Brooks & Kelton (1♀; CNC); Virden, 9-VII-1953, Brooks & Kelton (1♀; CNC). SASKATCHEWAN: Carlton, 11-IX-1948, J.R Vockeroth (1♂; CNC); Indian Head, 31-V-1924, J.J. deGryse (1♀; CNC); Torquay, 14-VIII-55, C.D. Miller (1♂; CNC). Province and locality not specified: #1902, #2042, collection C.F. Baker (2♀; USNM).

UNITED STATES. COLORADO: locality not specified, #2276, collection Baker (1♀; USNM). IDAHO: *Oneida Co.:* Holbrook, 5 mi NW, 16 May 1969, G.F. Knowlton, G.E. Bohart (1♀; CU). ILLINOIS: *Boone Co.:* Blaine, 1 mi N, taken on *Prunus virginiana*, 17-V-1970, J.C. Marlin (1♀; INHS). *Bureau Co.:* La Moille, 3 mi NW, taken on *Saliz* sp., 12-V-1970, LaBerge and Molina (4♀; INHS). *Jo Davies Co.:* Stockton, taken on *Cichorium intybus*, 18-VII-1968, J.C. Marlin (1♀; INHS). *Lee Co.:* Sublette, taken on *Brassica nigra*, 11-VII-1968, J.C. Marlin (1♀; INHS). [*McHenry Co.:*] Algonquin, 4-23-94, collection C.F. Baker (1♀; USNM), #8407, 4-30-95 (1♀; USNM), #8377, #8379, #8380, #8382, #8383, #8384, #8386, 5-5-97 (7♀; USNM), #8390, 5-7-97 (1♀; USNM), #8392, 5-8-97 (1♀; USNM), #8408, 5-23-95 (1♀; USNM), #8431, 20 May 1905, W.A. Nason (1♀; USNM), #930, Nason (1♀, USNM), #885, collection C.F. (1♀; USNM), #1697, #1698, collection C.F. Baker (2♀; USNM). *McLean Co.:* 0.5 mi E Weston, Weston Cemetery Nat.[ure?] Pres.[erve?], 22-VII-1980, E. Miliczky (1♀; INHS). *Woodford Co.:* 3 mi W El Paso, 22-VII-1980, E. Miliczky (1♀; INHS). *County not specified:* N.[orthern] Ill[inois], Am.[erican] Mus.[eum] Nat.[ural] Hist.[ory] Dep[artment] Invert.[ebrate] Zool.[ogy] No. 23953, 10-1-93 (1♀; AMNH).

INDIANA: [*Tippecanoe Co.:*] Lafayette, on *Solanum* sp., 12 Jul 1942, H.E. Milliron (1♀; UCR), on *Platycodon grandiflorium*, 12 Jul 1942, H.E. Milliron (2♂; UCR). MICHIGAN: *Barry Co.:* Yankee Springs Game Area, R.L. Fischer slide no. 664, VII-13-1959, Roland L. Fischer (1♀; MSUEL). *Cheboygan Co.:* locality not specified, VII–16 or VIII-6-1953, Stuart E. Neff (1♀; MSUEL). *Clinton Co.:* Rose Lake, at flowers [of] *Amelanchier canadensis*, IV-23-1955, R.W. Hodges (1♀; MSUEL). *Kalamazoo Co.:* Gull Lake Biol.[ogical] Sta.[tion], 23 Jul 1956, R.W. Hodges (1♀; MSUEL). *Lake Co.:* locality not specified, R.L. Fischer slide no. 665, IV-17-55, W.A. Drew (1♀; MSUEL). [*Oakland Co.:*] Farmington, on willow, 2 May 1937, G. Steyskal (1♀; MSUEL). *County not specified:* Bath, 5 Jun 1954, R.L. Fischer (1♀; MSUEL). NEBRASKA: [*Cuming Co.:*] West Point, Crawford no. 2891, on *Bidens*, IX-24-03, J.C. Crawford (1♀; USNM).

NORTH DAKOTA: [*Cass Co.:*] Fargo, on *Viola scabriuseulia*, 30 May 1913, O.A. Stevens (1♀; CU), #14749, on *Tamarix* flowers, 2 Jun 1933, O.A. Stevens (1♀; AMNH), #5118, on *Taraxacum taraxacum*, 20 Jun 1913, E.M. Stevens (1♀; AMNH), #1784, on Dracocephalum parviflorum, 26 Jun 1910, O.A. Stevens (1♀; AMNH), #1815, on *Asclepias syriaca*, 3 Jul 1910, O.A. Stevens (1♀; AMNH), #2518, on *Centaurea jacea* (cult.), 26 Jul 1911, O.A. Stevens (1♂; AMNH), #2629, on *Melilotus alba*, 14 Aug 1911, O.A. Stevens (1♂; CU), #15208, on *Rudbeckia laciniata*, 15 Aug 1948, O.A. Stevens (1♂; AMNH), #10707, on *Helianthus maximiliani*, 20 Aug 1917, O.A. Stevens (1♂; AMNH), #9705, on *Melilotus alba*, 22 Aug 1916, O.A. Stevens (1♂; AMNH), #3889, on *Melilotus alba*, 24 Aug 1912, O.A. Stevens (1♂; AMNH), #4000, on *Melilotus alba*, 1 Sep 1912, O.A. Stevens (1♂; AMNH), #11148, on *Solidago canadensis*, and #11169, around aphids on *Iva xanth.[ifolia]*, 11 Sep 1917, O.A. Stevens (2♀; AMNH). [*Dickey Co.:*] Oakes, #12238, *Symphoricarpos occidentalis*, 18 Jul 1919, O.A. Stevens (1♂; AMNH). [*Morton Co.:*] Mandan, #3357, on *Rosa*, and #3368, on *Pentstemon gracilis*, 16 Jun 1912, O.A. Stevens (2♀; AMNH). [*Nelson Co.:*] Lakota, #6725, on *Aster paniculatus*, 5 Sep 1913, O.A. Stevens (1♂; AMNH). [*Pierce Co.:*] Rugby, #10232, on *Braissica arvensis*, 7 Jul 1917, O.A. Stevens (1♀; AMNH). [*Ransom Co.:*] Enderlin, 7-4-17 (1♀; CU). [*Rolette Co.?:*] Turtle Mts., #10296, on *Sanicula marylandica*, #10306, 10307, on *Rosa*, #10321, on *Erigeron philadelphicus*, 8 Jul 1917, O.A. Stevens (4♀; AMNH). *County not specified:* Pleasant Lake, #6353, *Helianthus petiolaris*, 11 Aug 1913 (1♂; AMNH); Wales, #6254, on *Grindelia squarrosa*, 8 Aug 1912, O.A. Stevens (1♂; AMNH).

SOUTH DAKOTA: [*Brookings Co.:*] Brookings, 15 Oct 1944, H.C. Severin (2♂; UCR), 7–31, Jun H.C. Severin (1♀; UCR); Volga, Lot 230 (1♀; ANSP). [*Minnehaha Co.:*] Sioux Falls, #8011, on *Taraxacum taraxacum*, 14 May 1914, O.A. Stevens (1♀; AMNH). WISCONSIN: *Dane Co.:* Madison, IV-27-07, Hardenberg (1♀; USNM), VII-25-16 (1♀; UCR). [*Mil-*

waukee Co.] Milwaukee, collection W.H. Ashmead (1♀; USNM). *Polk Co.:* locality not specified, collection Baker, Baker (2♀; USNM). WYOMING: [*Albany Co.:*] Laramie, taken on *Salix* sp., 30-V-1968, D.W. Ribble (4♀; INHS). *Platte Co.:* locality not specified, VIII-8-1967, Dave Ribble Acc. (1♂; INHS).

Additional localities recorded: 959 specimens (868♀, 91♂).

CANADA. ALBERTA: Calmar; Drumheller; Engerton; Lethbridge. MANITOBA: Brandon, 6 mi NW; Onah. QUEBEC: Kazabazua. NEW BRUNSWICK: Kouchibouguac National Park; *Charlotte Co.* ONTARIO: Coldwater; Credit Forks; Delta; Edgar; Kendal; Leaside; Markham; Opinicon; Orangeville; Port Credit; Primrose; Strathroy; Toronto; Vandorf; Vivian Forest; Woodstock. SASKATCHEWAN: Canora; Estevan; Ft. QuAppelle; Love; Mortlatch; Prince Albert; Saskatoon; St. Victor; Zealandia.

UNITED STATES. COLORADO: *Boulder Co.:* Longmont; *Custer Co.:* Westcliffe; *Delta Co.:* Delta, Hotchkiss, Paonia; *Denver Co.:* Denver; *El Paso Co.:* Colorado Springs, Foster Ranch, Ramah; *Garfield Co.:* Rifle; *La Plata Co.:* Durango; *Larimer Co.:* Ft. Collins; *Lincoln Co.:* Limon; *Mesa Co.:* Palisade; *Prowers Co.:* Lamar, 10 mi N; *Pueblo Co.:* Pueblo. DISTRICT OF COLUMBIA. IDAHO: *Bingham Co.:* Bingham (7 mi NW), Grandview, Springfield; *Boundary Co.:* Bonners Ferry; *Cassia Co.:* Burley, Raft River Narrows; *Jefferson Co.:* Rigby; *Jerome Co.:* Hazelton (3 mi NE Hunt Project); *Twin Falls Co.:* Buhl, Rock Creek.

ILLINOIS: *Cook Co.:* Chicago; *Knox Co.:* Galesburg. INDIANA: *Carroll Co.:* Delphi; *Porter Co.:* Valparaiso. IOWA: *Black Hawk Co.; Dubuque Co.:* Dubuque; *Hamilton Co.:* Webster City; *Story Co.:* Ames, 2, 4 mi NW; *Woodbury Co.:* Sioux City. KANSAS: *Anderson Co.:* Garnett; *Doniphan Co.:* Troy, 6 mi S; *Douglas Co.:* Baldwin, Lawrence; *Jefferson Co.:* Oskaloosa; *Leavenworth Co.:* Reno, Tonganoxie; *Marshall Co.:* Marysville; *Pottawamie Co.:* Little Gobi Desert; *Riley Co.:* Manhattan. MAINE: *York Co.:* Saco. MICHIGAN: *Allegan Co.:* Allegan, Fernville; Barry Co.: Hickory Corners. *Cheboygan Co.:* University of Michigan Biological Station; *Chippewa Co.; Eaton Co.:* Dimondale, Potterville; *Ingham Co.:* East Lansing; *Jackson Co.:* Jackson; *Kalkaska Co.; Lake Co.; Lenawee Co.:* Onsted; *Mackinac Co.; Mecosta Co.; Midland Co.:* Midland; *Montcalm Co.; Newago Co.; Oakland Co.:* Farmington; *Oscoda Co.:* Luzerne. MINNESOTA: *Anoka Co.:* Bunker Prarier, Fridley Sand Dunes; *Beltrami Co.:* Bemidji; *Bigstone Co.; Carver Co.:* Zumbra Heights; *Chisago Co.; Clay Co.:* Buffalo River State Park, Hitterdal (8 mi W), Moorhead; *Clearwater* or *Hubbard Co.:* Itasca State Park; *Dakota Co.; Goodhue Co.; Hennepin Co.:* Nine Mile Creek, St Anthony Park; *Houston Co.; Lac Qui Parle Co.:* Lake Lac Qui Parle (5 mi S Milan); *Lyon Co.:* Camden State Park, Marshall; *Murray Co.:* Lake Shetek State Park; *Otter Tail Co.; Pine Co.; Pipestone Co.:* Pipestone (Olive Falls, Pipestone National Monument); *Polk Co.:* Crookston; *Pope Co.:* Glacial Lakes State Park; *Ramsey Co.:* New Brighton, St. Paul; *Rice Co.:* Circle Lake near Millersburg; *Rock Co.:* Blue Mounds State Park, Luverne; *Roseau Co.:* Warroad; *Swift Co.; Wadena Co.; Waseca Co.:* Waseca; *Winona Co.*

MONTANA: *Flathead Co.:* Big Fork; *Gallatin Co.:* Bozeman; *Hill Co.:* Fresno Dam. NEBRASKA: *Adams Co.:* Hastings; *Antelope Co.:* Neligh; *Chase Co.:* Enders, Wauneta, 2 mi E; *Cherry Co.:* Niobara River (10 mi S Nenzel); *Harlan Co.:* Republican City; *Hall Co.:* Alda, 4 mi W; *Hooker Co.; Lancaster Co.:* Lincoln; *Saline Co.:* Crete. NEVADA: *Elko Co.:* Elko. NEW MEXICO: *Bernalillo Co.:* Albuquerque; *Socorro Co.:* Bernardo; *San Juan Co.:* Aztec; *San Miguel Co.:* Las Vegas; *Valencia Co.:* Belen. NORTH DAKOTA: *Billings Co.:* Medora, 10 mi W; *Burleigh Co.:* Bismarck; *Cass Co.:* Kindred; *Grand Forks Co.; La Moure Co.:* Kulm; *McKenzie Co.:* Theodore Roosevelt National Park; *Mountrail Co.:* Stanley, 5 mi SW; *Ramsey Co.:* Devil's Lake (including 6 mi E); *Ransom Co.:* Lisbon, McLeod, 1 mi SE; *Richland Co.:* Mirror Pool, Walcott (11 mi W), Walcott Dunes; *Slope Co.:* Chalky Buttes; *Stark Co.:* Dickerson; *Walsh Co.:* Drayton, Minto, 12 mi SE.

OHIO: *Franklin Co.:* Columbus; *Fulton Co.:* Swanton; *Lucas Co.* SOUTH DAKOTA: *Clark Co.:* Clark; *Hughes Co.:* Pierre; Sioux Falls. UTAH: *Duchesne Co.:* Duchesne; *Cache Co.; Emery Co.:* Castle Dale; *Grand Co.; Utah Co.:* Provo environs. WISCONSIN: *Burnett Co.:* Grantsburg, 10 mi NE: *Door Co.:* Sturgeon Bay; *Grant Co.:* Lancaster; *Jackson Co.:* Millston; *Marathon Co.:* Wausau; *Pierce Co.; Polk Co.:* Gibson Lake, Nevers Dam; *Rock Co.; Sauk Co.:* Sauk City; *Vernon Co.:* Genoa; *Washburn Co.:* Spooner; *Washington Co.:* West Bend; *Waupaca Co.; Wood Co.:* Griffith State Nursery. WYOMING: *Crook Co.:* Devel's Tower; *Goshen Co.:* Jay Em; *Park Co.* or *Teton Co.:* Yellowstone National Park; *Weston Co.:* Newcastle, 22 mi W.

21. *Lasioglossum fuscipenne* (Smith)

FIGURES 33, 443–456

Halictus fuscipennis Smith, 1853:67 [female, male].—Dalla Torre, 1896:62 [World catalog].

Lasioglossum fuscipenne.—Robertson, 1902:34 [key].—Michener, 1951:1106 [Nearctic catalog].—Mitchell, 1960:348 [redescription, key].—Knerer and Atwood, 1962:163 [locality and flower records].—Hurd, 1979:1957 [Nearctic catalog].—Duffield et al., 1981:323 [Dufour's gland chemistry].

Halictus capitulatus Vachal, 1904:472 [female].—Cockerell, 1905a:90 [key].—Mitchell, 1960 [synonymy].

Curtisapis fuscipennis.—Robertson, 1918:91.—Reinhard, 1924:371 [predator, *Philanthus gibbosus*].—Robertson, 1929 [flower records].

TYPE MATERIAL.—In his original description of *Halictus fuscipennis*, Smith described the female and male but his only reference to the type series was "Hab. St. John's Bluff, East Florida. (Coll. E. Doubleday, Esq.)." The lectotype female, herein designated, is associated with the above data and is labeled "Type" (handwritten by Smith?). Its full label data are

> Type H.T. [circular label with orange-red border]/B.M. TYPE HYM. 14.a.1005/B.M. TYPE HYM. Halictus fuscipennis Smith 1853/fuscipenne Sm.[ith] Type [handwritten by Smith?]/E. Doubleday. St. John's Bluff, E.[ast] Florida./ LECTOTYPE Halictus fuscipennis Smith des.[ignated by] McGinley [red label].

The lectotype, in the British Museum (Natural History), is missing the left antenna and the hind left tarsus but is otherwise in fair condition.

The female holotype of *Halictus capitulatus*, in the Paris Museum (MNHNP), is labeled

> Teness.[Tennessee]/Museum Paris, coll. O. Sichel 1867/ Holotype [handwritten on red label]/capitulatus Vach.[al] ♀ [handwritten]/Halictus capitulatus Vach.[al] [handwritten].

During shipment in August 1983, the abdomen beyond the first metasomal segment broke off. This was apparently due to weakening of the area by old dermestid damage as evidenced by a small circular hole on the right side of the abdomen. The abdomen was reglued to the specimen with PVA by McGinley. The specimen is also missing the last two tarsomeres of the middle left leg but is otherwise in good condition. Moure and Hurd (1986) have correctly noted that the holotype is labeled only from "Teness. [Tennessee]," whereas in the original description Vachal recorded the type from "Teness., Mex.[ico]"; the Mexican reference evidently the result of an error in transcription.

DISTRIBUTION (Figure 443).—*Lasioglossum fuscipenne* is presently known to occur from Massachusetts through southern Florida and west to Michigan, eastern Kansas, and eastern Oklahoma. Hurd (1979) records this species from Nova Scotia to Ontario, south to Texas and Florida. Although I have not seen specimens from Texas and Ontario, their occurrence there is possible; the northern records to Nova Scotia are undoubtedly incorrect.

DIAGNOSIS.—The females of *Lasioglossum fuscipenne* can be distinguished from all other New World *Lasioglossum* by their distinctive dorsal propodeal surface (Figure 448), which is sharply truncated posteriorly; the lateral rims of the propodeal triangle are low but distinct and enclose a ruguloso-striate to irregularly striate area that sharply contrasts with the smooth propodeal surface outside the lateral rims. Additional helpful characters are the sharply pointed pronotal lateral angle, which forms a right angle (Figure 449), the relatively sparse mesoscutal punctation with most punctures separated by a distance greater than their width (Figure 449), and the lack of a first metasomal acarinarium.

Males of *Lasioglossum fuscipenne* are unique in having the posterior half of metasomal sterna II–IV densely covered by short, conspicuous hair patches (Figure 189). Unlike other *Lasioglossum* from the eastern United States except *L. leucozonium* and *L. zonulum*, the clypeus is rounded, not conspicuously flattened. The head is noticeably narrowed below with the eyes converging ventrally (Figure 445, similar to head of *L. leucozonium*, Figure 493). Both *L. leucozonium* and *L. zonulum* males differ greatly from those of *L. fuscipenne* in their sternal vestiture (compare Figures 189, 204, 205). As in the female, the pronotal lateral angle of the male *L. fuscipenne* is sharply produced.

DESCRIPTION.—FEMALE: (1) Length 8.2–10.1 mm ($\bar{x} = 9.2$, $n = 15$); (2) wing length 2.7–3.1 mm ($\bar{x} = 2.9$, $n = 15$); (3) abdominal width 2.7–3.2 mm ($\bar{x} = 3.0$, $n = 15$).

Structure: (4) Head moderately elongate (Figure 444; length/width ratio 0.88–0.96, $\bar{x} = 0.92$, $n = 15$). (7) Supraclypeal area evenly rounded, (8) moderately protuberant. (9) Clypeus projecting approximately 0.70 of its length below lower margin of eyes; (11) surface without median longitudinal sulcation. (14) Distance between lateral ocelli slightly exceeding distance between lateral ocellus and eye. (23) Flagellomere 1 subequal in length to 2 along dorsal surface. Labrum as in Figure 446; (27) distal keel narrow in frontal view, lateral edges slightly bowed; (28) distal

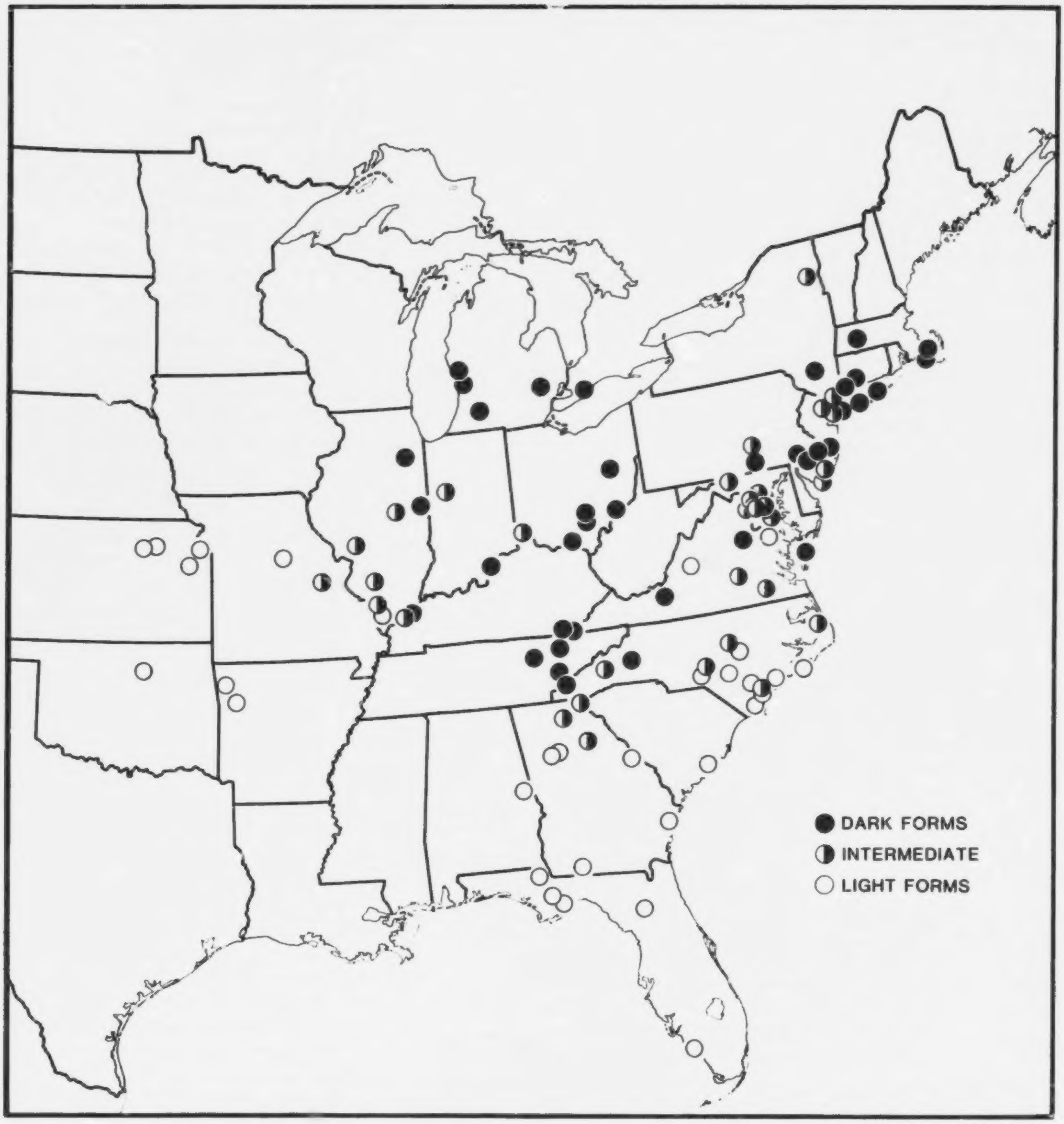


FIGURE 443.—Distribution of *Lasioglossum fuscipenne* showing distribution of specimens with dark legs (dark forms), specimens with yellowish orange middle and hind tibiae and tarsi (light forms), and localities where intermediate forms or a mixture of dark and light forms occur (see "Remarks" section).

lateral projections absent; (29) fimbrial setae acutely pointed.

(32) Pronotal lateral angle forming well-produced right angle; (33) pronotal lateral ridge incomplete, broadly interrupted by oblique lateral sulcus; (34) lower portion of lateral ridge narrowly rounded. (35) Mesoscutal lip moderately bilobed, (36) strongly elevated from pronotum. (40) Dorsal surface of propodeum about 0.88 the length of scutellum and about 1.5 times the length of metanotum, (41) not depressed centrally, (42) posterior margin sharply truncated; (43) propodeal triangle weakly to moderately well defined, evident medially as a low V-shaped elevation with low but distinct lateral rims extending towards metanotum; (44) lateral carinae encircling posterior surface of propodeum, interrupted medially by V-shaped elevation. (45) Tibial spur as in Figure 33.

(46) Lateral edge of metasomal tergum II very weakly sinuate, nearly straight posteriorly.

Sculpture: (47) Face moderately shiny, (48) densely punctate below ocelli, punctures contiguous, becoming larger and less dense near antennae. (51) Supraclypeal area extremely granulate, (51) uniformly punctate, punctures separated by 1–3 times their width. (53) Clypeus granulate; (54) punctation nearly uniform, punctures separated by their width. becoming larger apically. (56) Mesoscutum moderately shiny, noticeably but finely patterned; (57) punctation nearly uniform throughout (Figure 449), punctures usually 2 times their width apart. (58) Scutellum nearly uniformly punctate, punctures less dense than those of mesoscutum 1–4 times their width apart. (63) Dorsal surface of propodeum (Figure 448) ruguloso-striate, striae becoming more irregular medially, not reaching posterior margin; (64) surface alveolated. (65) Metasomal tergum I moderately dull, obscurely granulate; (66) punctation very fine, obscure, punctures separated by 1–3 times their width.

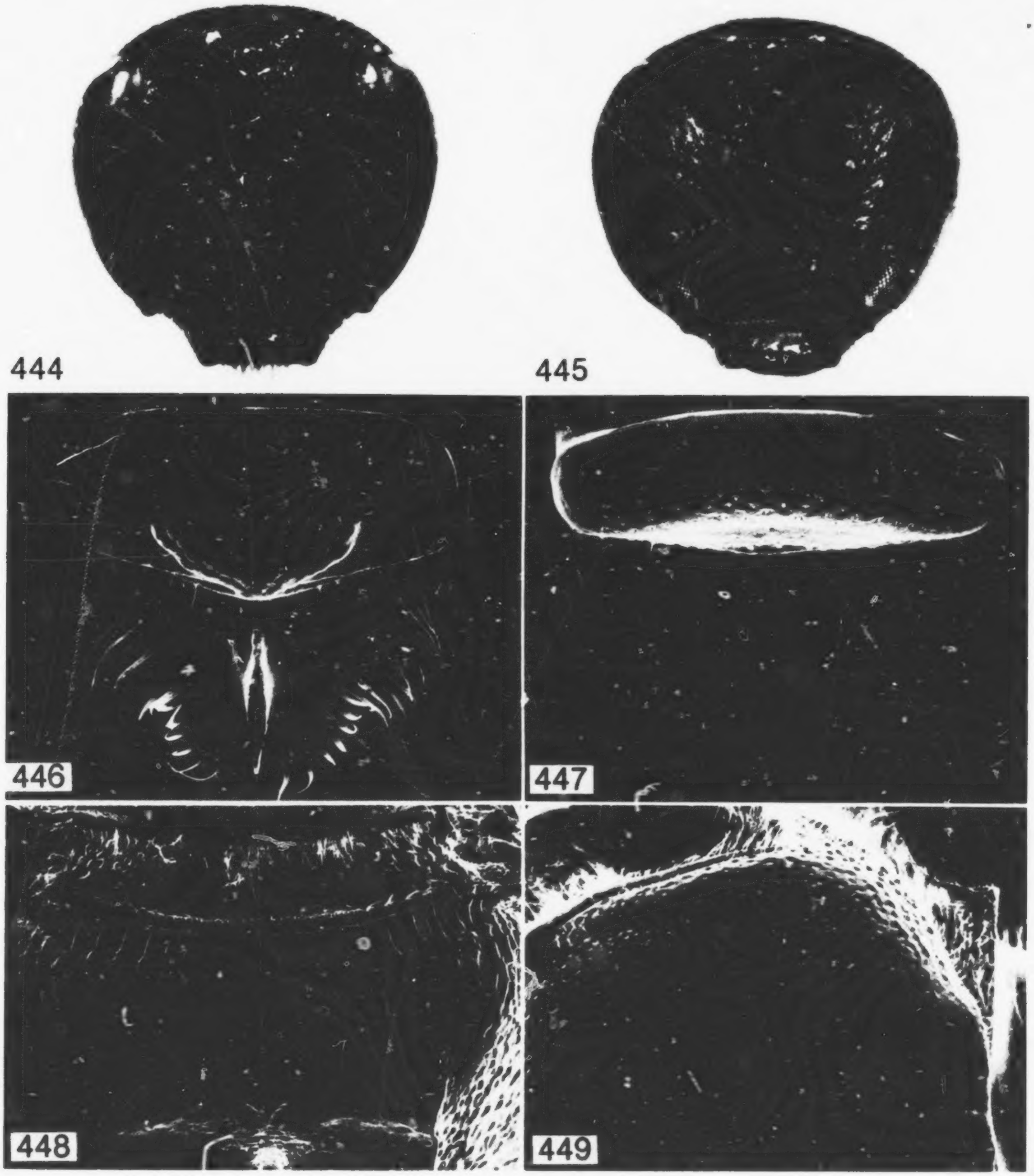
Coloration: (71) Wing membrane with clinal variation in pigmenation, correlated with leg color: southern forms with pale yellowish orange legs have conspicuously infuscated wings, especially anteriorly in marginal cell to apex; northern forms with dark legs have lightly infuscated wings (see "Remarks" section). (72) Unlike most species, legs show apparent clinal variation in pigmentation: southern and western forms with tibiae and tarsi of middle and hindlegs pale yellowish orange (see "Remarks" section).

Vestiture: (74) Pubescence of head pale yellowish brown to white. (75) Pubescence of thorax white to yellowish white; (76) mesoscutal hairs sparse, obscurely plumose. (77) Hind tibial hairs concolorous, yellowish brown. (78) Anterior hairs of metasomal tergum I and (79) basal hair bands of terga II–IV white. (80) Acarinarium absent, elongate hairs scattered over anterior surface of tergum I.

MALE: Similar to female except as follows: (1) length 7.3–9.6 mm ($\bar{x}$ = 8.1, n = 15); (2) wing length 2.2–2.5 mm ($\bar{x}$ = 2.3, n = 15); (3) abdominal width 1.8–2.5 mm ($\bar{x}$ = 2.0, n = 15). (4) Head as in Figure 445 (length/width ratio 0.80–1.0, $\bar{x}$ = 0.93, n = 15). (5) Gena conspicuously narrower than eye; (6) rounded, not produced posteriorly. (10) Clypeal surface broadly rounded, not flattened or depressed. Labrum as in Figure 447; (24) distal process virtually absent; (25) basal area rounded medially, not depressed; (26) basal lateral depressions absent. (30) Mandible short, just reaching opposing clypeal angle. (53) Clypeus granulate; (54) punctures well formed throughout, less dense on apical half, approximately 1–2 times their width apart. (68) Clypeal maculation present (Figure 445). (69) Flagellum brown ventrally, contrasting with dark dorsum. (72) Tarsi dark, concolorous with tibiae or tarsi yellowish orange, contrasting with dark tibiae (pale leg coloration occurs in the southern and western portions of the species distribution; see "Remarks" section).

Vestiture: Sternal vestiture as in Figure 189; (82) sternum IV (as well as sterna II–III) with conspicuous patches of dense, adpressed hairs; (83) sternum V with less conspicuous, median rosette of adpressed hairs, posterior edge of sternum with moderately elongate lateral hair fringes.

Terminalia: Sterna VII–VIII as in Figure 454; (85) sternum VIII without median process.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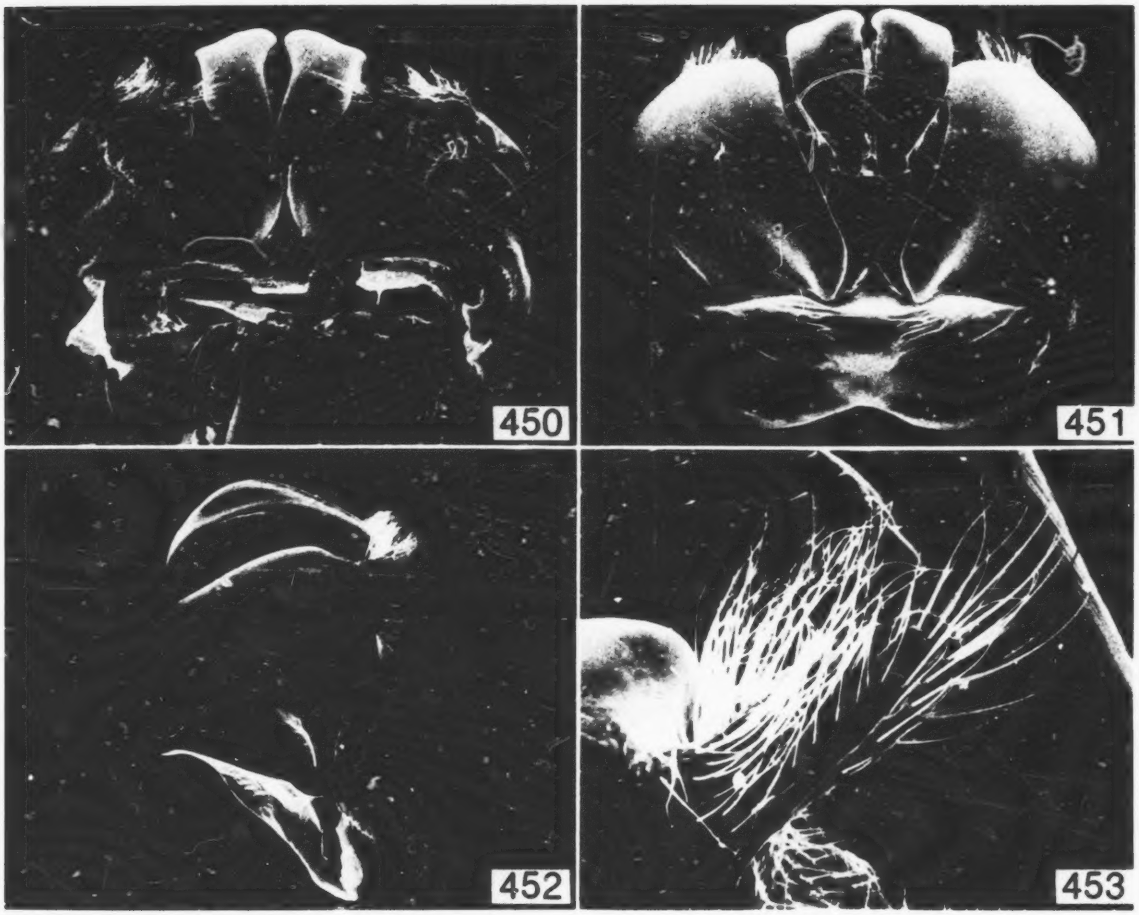
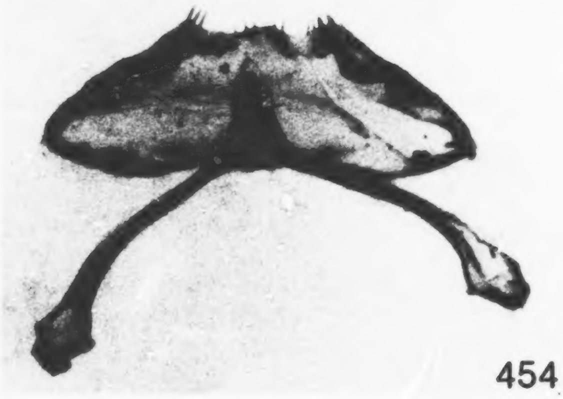
FIGURES 444–449.—*Lasioglossum fuscipenne:* 444, female head; 445, male head; 446, female labrum; 447, male labrum; 448, female propodeum; 449, female mesoscutum.





FIGURES 450–454.—*Lasioglossum fuscipenne,* male: 450, genitalia, ventral view; 451, same, dorsal view; 452, same, lateral view; 453, gonostylus; 454, sterna VII–VIII.

Genitalia as in Figures 450–453; (86) gonobase moderately elongate; (87) gonostylus moderately elongate and broad, parallel-sided, apex broadly rounded; (89) retrorse membranous lobe moderately broad; (90) volsella with prominent lateral lobe.

FLIGHT RECORDS (Figure 455).—Label data indicate that *L. fuscipenne* is possibly bivoltine in the southern portion of its range. In Arkansas, Florida, Georgia, North Carolina, and South Carolina males have been collected in March and April and then again from October through early December. Females in this area have only been collected from March to July but undoubtedly occur later in the season along with the males. Northern records suggest a univoltine pattern, with females most commonly collected in May and early June. Males in the mid-Atlantic region have been most commonly taken in early October.

FLOWER RECORDS.—95% of the floral records for *Lasioglossum fuscipenne* males were from the Compositae. This is probably a result of the many late season records for this species during the abundance of *Aster* and *Solidago* blooms rather than due to any specificity on the part of the bees. Little can be said about female floral associations other than that they are most likely polylectic.

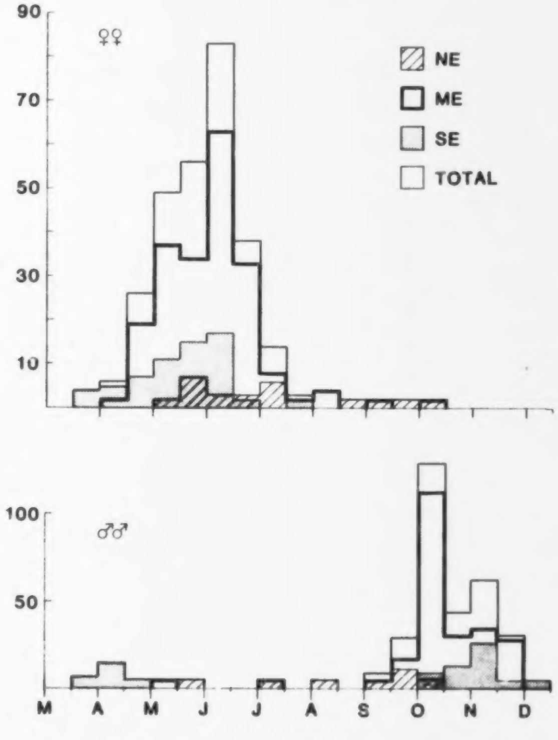


FIGURE 455.—*Lasioglossum fuscipenne* flight records.

Summary: Females (74): Anacardiaceae 24%; Fagaceae 11%; Compositae 11%; Hydrophyllaceae 10%. Males (118): Compositae 95%. Total: 192 in 22 families, 34 genera as follows:

Alliaria 2♀; *Apocynum* 3♀; *Aquilegia* 1♀; *Aruncus* 1♀; *Asclepias* 1♀; *Aster* 36♂; *Barbarea* 3♀; *Batodendron* 1♀; *Bidens* 13♂; *Carya* 1♂; *Castanea* 8♀; *Ceanothus* 5♀; *Chrysanthemum* 3♀, 2♂; *Erigeron* 1♀; *Euphorbia* 1♀; *Geranium* 1♀; *Hydrophyllum* 7♀; *Ilex* 2♀; *Krigia* 1♀; **Ligustrum* 1(1)♀; *Linaria* 1♀; *Lobelia* 1♀; *Lyonia* 1♂; *Prunus* 2♂; *Pyrus* 1♀; *Rhus* 17♀; *Salix* 3♀; 2♂; *Senecio* 3♀, 2♂; *Solidago* 58♂; *Tephrosia* 2♀; *Vaccinium* 1♀, 1♂; *Viburnum* 1♀; *Vitis* 1♀; *Waldsteinia* 1♀.

REMARKS.—As illustrated in the *L. fuscipenne* distribution map (Figure 443), specimens having entirely dark legs occur primarily in the northern portion of the species range. Forms having the tibiae and tarsi of the middle and hindlegs pale yellowish orange are found to the south and far west. Localities where females are intermediate in leg color or where both color forms are found are indicated on the map by half-darkened dots. An examination of the specimens from three intermediate localities also indicates a clinal trend in pigmentation (Figure 456). Unlike the females, where intermediacy in leg color is common, the legs of males are either dark or light.

SPECIMENS EXAMINED.—678 (331♀, 347♂).

CANADA. ONTARIO: Leawington, Rondeau Park.

UNITED STATES. ALABAMA: *Chambers Co.:* Langdale. ARKANSAS: *Franklin Co.:* Cass, 5 mi NE; *Washington Co.:* unspecified locality. CONNECTICUT: *Fairfield Co.:* New Canaan; *New Haven Co.:* New Haven, Orange. DISTRICT OF COLUMBIA: Rock Creek Park. FLORIDA: *Alachua Co.:* Gainesville, San Felasco Hammock; *Collier Co.:* Colliers-Seminole State Park; *Duval Co.:* Jacksonville; *Franklin Co.:* Panacea, 10 mi S; *Jackson Co.:* Florida Caverns State Park; *Liberty Co.:* Torreya State Park. GEORGIA: *Clarke Co.:* unspecified locality; *De Kalb Co.:* Stone Mt.; *Duval Co.:* Jacksonville; *Fulton Co.:* Atlanta; *Liberty Co.:* St. Catherines Island; *Lumpkin Co.; Rabum Co.:* Tiger; *Richmond Co.:* Augusta. ILLINOIS: *Hardin Co.:* Elizabethtown, 4 mi W; *Jackson Co.:* Giant City State

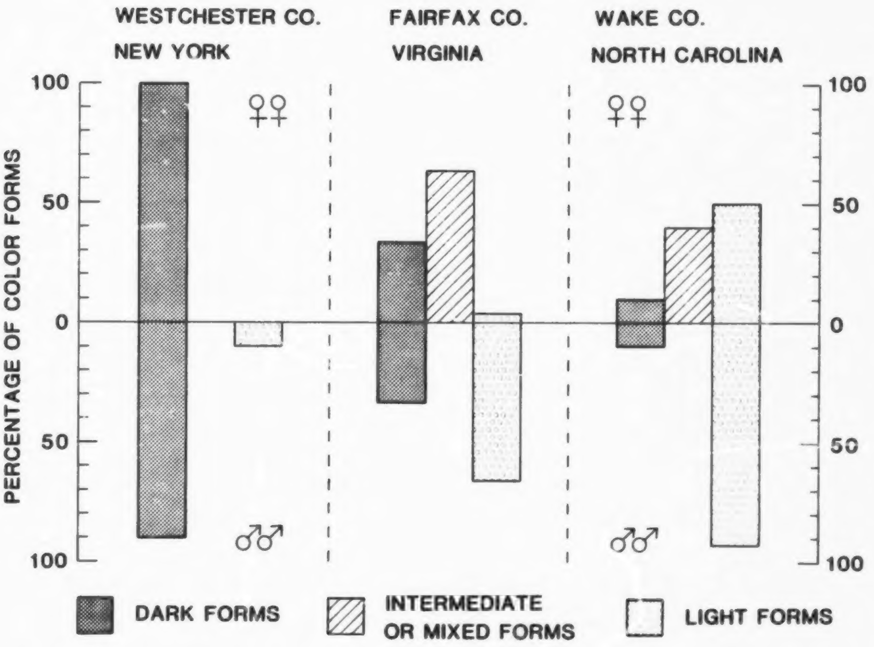


FIGURE 456.—Apparent clinal variation in *Lasioglossum fuscipenne* leg coloration (see "Remarks" section).

Park; *Macoupin Co.:* Carlinville; *Piatt Co.:* White Heath; *Pope Co.:* Bell Smith Springs; *Union Co.:* Dongola; *Vermilion Co.:* Westville, 5 mi SE; *Washington Co.:* Washington Lake Conservation Area; *Will Co.:* Braidwood. INDIANA: *Clark Co.:* unspecified locality; *Tippecanoe Co.:* West Lafayette.

KANSAS: *Douglas Co.:* Breidenthal Reserve (2 mi N Baldwin); *Leavenworth Co.:* Leavenworth; *Pottawatomie Co.:* unspecified locality; *Riley Co.:* Manhattan. KENTUCKY: *Bell Co.:* Pine Mt. State Park. MARYLAND: *Calvert Co.:* Chesapeake Beach; *Howard Co.:* Woodstock; *Montgomery Co.; Prince Georges Co.: County unspecified* (may be in West Virginia): C & O Canal (Harper's Ferry vicinity). MISSOURI: *Boone Co.:* Columbia; *Franklin Co.:* Missouri Botanical Garden Arboretum, Sullivan. MASSACHUSETTS: *Barnstable Co.:* Dennis; *Dukes Co.:* Martha's Vineyard; *Hampshire Co.:* Ware. MICHIGAN: *Kalamazoo Co.:* Gull Lake Biological Station; *Muskegon Co.:* unspecified locality; *Oakland Co.:* Lake Angelus; *Ottawa Co.:* unspecified locality. NEW JERSEY: *Atlantic Co.:* Ocean City; *Bergen Co.; Burlington Co.; Camden Co.:* Clementon; *Cape May Co.:* South Seaville; *Essex Co.:* Montclair; *Gloucester Co.:* Malaga, North Woodbury; *Ocean Co.:* Lakehurst.

NEW YORK: *Bronx Co.; Essex Co.:* Mt. Marcy; *Nassau Co.; Suffolk Co.; Ulster Co.:* Kerhonkson, 4 mi NNW; *Westchester Co.:* Ardsley, Lewisboro. NORTH CAROLINA: *Brunswick Co.:* Southport; *Buncombe Co.:* Black Mt.; *Burke Co.:* Lake James; *Carteret Co.:* Harkers Island; *Cumberland Co.:* Fort Bragg; *Dare Co.; Graham Co.:* Robbinsville; *Johnston Co.:* unspecified locality; *Moore Co.:* Southern Pines; *New Hanover Co.:* Castle Hayne; *Onslow Co.:* Jacksonville; *Pender Co.:* Burgaw; *Richmond Co.:* unspecified locality; *Sampson Co.:* Ivanhoe; *Wake Co.:* Raleigh. OHIO: *Hamilton Co.:* Cincinnati; *Hocking Co.:* unspecified locality; *Scioto Co.:* unspecified locality; *Tuscarawas Co.:* unspecified locality; *Vinton Co.:* unspecified locality; *Washington Co.:* Marietta. OAKLAHOMA: *Pawnee Co.:* Jennings, 4 mi N.

PENNSYLVANIA: *Dauphin Co.:* Harrisburg; *Delaware Co.:* unspecified locality; *York Co.:* Davidsburg, 5 mi NW. SOUTH CAROLINA: *Charleston Co.:* Dewees Island. TENNESSEE: *Blount Co.:* Tallassee; *Morgan Co.:* Burrville; *Union Co.:* LaFolette, 9 mi SE. VIRGINIA: *Accomack Co.:* Painter; *Amelia Co.:* Amelia; *Arlington Co.; Fairfax Co.; Lee Co.:* Cumberland Gap; *Montgomery Co.:* Blacksburg; *Rockbridge Co.:* Brushy Mts.; *Spotsylvania Co.:* Fredericksburg; *Sussex Co.:* Jarratt; *Westmoreland Co.:* Westmoreland State Park.

22. *Lasioglossum heterorhinum* (Cockerell)

FIGURES 34, 457–471

Halictus heterorhinus Cockerell, 1930:6 [female].
Lasioglossum heterorhinum.—Michener, 1951:1106 [Nearctic catalog].—Hurd, 1979:1957 [Nearctic catalog].

TYPE MATERIAL.—The female holotype, in

the American Museum of Natural History, is labeled

Mesa Verde [Montezuma County], Colo. [rado] July 3–7, [19]'19 F4370F [?]/About 37°12′ N.[orth] "[about] 108°29′ W.[est]" [about] 7300 ft.[feet]/Halictus heterorhinus Ckll. [Cockerell] TYPE [handwritten by Cockerell]

The specimen is missing the right antenna and the tibia and tarsus of the hind left leg but otherwise is in excellent condition. No paratypes were designated by Cockerell.

Distribution (Figure 457).—*Lasioglossum heterorhinum* is found through portions of the Rocky Mountain system and the Black Hills, south into Mexico. Many specimens are associated with elevation data that range from 4300 to 9000 feet. In the United States this species is now known from Arizona, Colorado, Nevada, New Mexico, South Dakota, and Utah. Two females in the Oregon State Collection were collected in Hidalgo, Mexico. They appear to be conspecific with the northern specimens, apparently differing only by their darker scopal hairs. Also appearing conspecific is one male collected in Veracruz (Utah State University). Future collecting in the mountainous areas of northern and central Mexico will probably produce more specimens of this species.

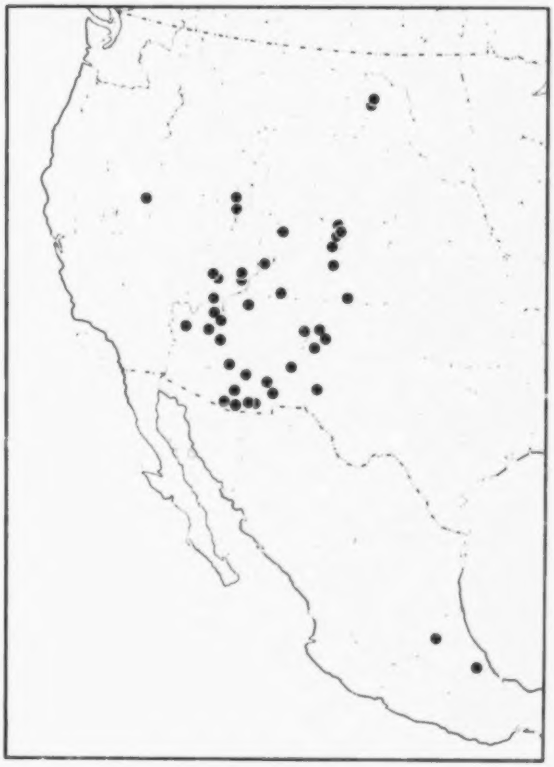


FIGURE 457.—Distribution of *Lasioglossum heterorhinum*.

Diagnosis.—*Lasioglossum heterorhinum* can be recognized by the following unique character combination: pronotal lateral carina complete, not interrupted by oblique sulcus (as in Figure 9); mesoscutum dull, granuloso-punctate on anterior half, punctures less dense and surface shiny on posterior half (Figure 463); acarinarium absent, elongate, dense hairs scattered over anterior surface of metasomal tergum I; head short (Figure 458, length/width ratio 0.76–0.92, $\bar{x}$ = 0.86); basal half of clypeus conspicuously granulate, contrasting with polished apical half; wing membranes pale yellowish brown.

In the United States, only two other species have a complete pronotal lateral carina, *L. lampronotum* and *L. channelense* (carina actually microscopically notched, Figure 100). The mesoscutum of *L. lampronotum* is very shiny throughout, not dull, granuloso-punctate on the anterior half. *Lasioglossum lampronotum* also has a completely polished clypeus (not granulate basally), hyaline wing membranes (not pale yellowish brown), and pale yellowish orange hind legs (usually dark brown in *L. heterorhinum*). *Lasioglossum channelense*, known only from the Channel Islands of California, is easily differentiated by its relatively elongate head (Figure 319) and metasomal acarinarium (Figure 330). *Lasioglossum rupticristum* is very similar to and sympatric with *L. heterorhinum* but has an incomplete pronotal lateral carina, hyaline wings, and an entirely polished clypeus.

A number of Mexican *Lasioglossum* species have complete pronotal lateral carinae but differ from *L. heterorhinum* in details of mesoscutal or propodeal sculpture, or by having acarinaria or elongate heads. *Lasioglossum argutum* is the most similar Mexican species to *L. heterorhinum* but can be recognized by its distinctive dorsal propodeal surface, which is highly polished and shiny on the posterior half.

The males of *L. heterorhinum* and *L. lampronotum* can be recognized by their broad heads (Figures 459, 487), complete pronotal lateral carina (as in Figure 9), and characteristic hair lobes on the posterior edge of sternum V (Figure 464; these lobes are more widely separated than those of *L. desertum*, Figure 387). *Lasioglossum heterorhinum* differs from *L. lampronotum* by having dark brown tarsi (yellowish white in *L. lampronotum*), and like the females, having the anterior portion of the mesoscutum granuloso-punctate (punctures distinctly separated in *L. lampronotum*).

DESCRIPTION.—FEMALE: (1) Length 7.5–9.0 mm ($\bar{x}$ = 8.5, n = 15); (2) wing length 2.4–2.8 mm ($\bar{x}$ = 2.6, n = 15); (3) abdominal width 2.5–2.9 mm ($\bar{x}$ = 2.7, n = 15).

Structure: (4) Head short (Figure 458; length/width ratio 0.76–0.92, $\bar{x}$ = 0.86, n = 15). (7) Supraclypeal area evenly rounded, (8) weakly protuberant. (9) Clypeus projecting approximately 0.64 of its length below lower margin of eyes; (11) surface with obscure median longitudinal sulcation present in most specimens (weakly developed or obscured by punctures in some). (14) Distance between lateral ocelli subequal to distance between lateral ocellus and eye. (23) Flagellomere 1 slightly shorter than 2 along dorsal surface. Labrum as in Figure 460; (27) distal keel moderately broad in frontal view, lateral edges bowed; (28) distal lateral projections weakly developed, rounded; (29) most fimbrial setae bluntly pointed.

(32) Pronotal lateral angle narrowly obtuse; (33) pronotal lateral ridge complete, obscure oblique lateral sulcus reaching ridge but not distinctly interrupting it; (34) lower portion of lateral ridge sharply edged. (35) Mesoscutal lip weakly bilobed, (36) moderately elevated from pronotum. (40) Dorsal surface of propodeum about 0.78 the length of scutellum and about 1.3 times the length of metanotum, (41) very slightly depressed centrally, (42) posterior margin broadly rounded; (43) propodeal triangle weakly defined, evident medially as a low V-shaped elevation with low lateral rims, fading towards metanotum; (44) lateral carinae extending at most to midpoint of posterior surface. (45) Tibial spur as in Figure 34.

(46) Lateral edge of metasomal tergum II weakly sinuate.

Sculpture: (47) Face moderately shiny, (48) densely and uniformly punctate between ocelli and antennae, punctures contiguous. (51) Supraclypeal area extremely granulate; (52) uniformly punctate, punctures separated by 1–3 times their width. (53) Clypeus strongly granulate basally, apical half polished; (54) punctation obscure, virtually absent apicolaterally. (56) Mesoscutum mostly shiny, dull anteriorly; (57) punctation as in Figure 463, punctures extremely dense laterally, contiguous, becoming granuloso-punctate anteriorly, relatively sparse centrally, punctures less dense anteriorly adjacent to median line, separated by their width. (58) Scutellum granuloso-punctate posteriorly, punctures less dense anteriorly adjacent to median line, separated by width. (63) Dorsal surface of propodeum (Figure 462) mostly rugulose, ruguloso-striolate on extreme lateral edges, striae and rugulae reaching posterior margin; (64) surface obscurely alveolated. (65) Metasomal tergum I moderately shiny; (66) punctation fine, extremely dense, punctures nearly contiguous.

Coloration: (71) Wing membrane very pale yellowish brown.

Vestiture: (74) Pubescence of head white. (75) Pubescence of thorax white; (76) mesoscutal hairs moderately dense and plumose. (77) Hind tibial hairs concolorous, pale yellowish brown. (78) Anterior hairs of metasomal tergum I and (79) basal hair bands of terga II–IV white. (80) Acarinarium absent, elongate hairs scattered over anterior surface of tergum I.

MALE: Similar to female except as follows: (1) length 7.0–8.6 mm ($\bar{x}$ = 7.7, n = 2); (2) wing length 2.1–2.6 mm ($\bar{x}$ = 2.4, n = 15); (3) abdominal width 1.8–2.6 mm ($\bar{x}$ = 2.2, n = 15). (4) Head as in Figure 459 (length/width ratio 0.77–

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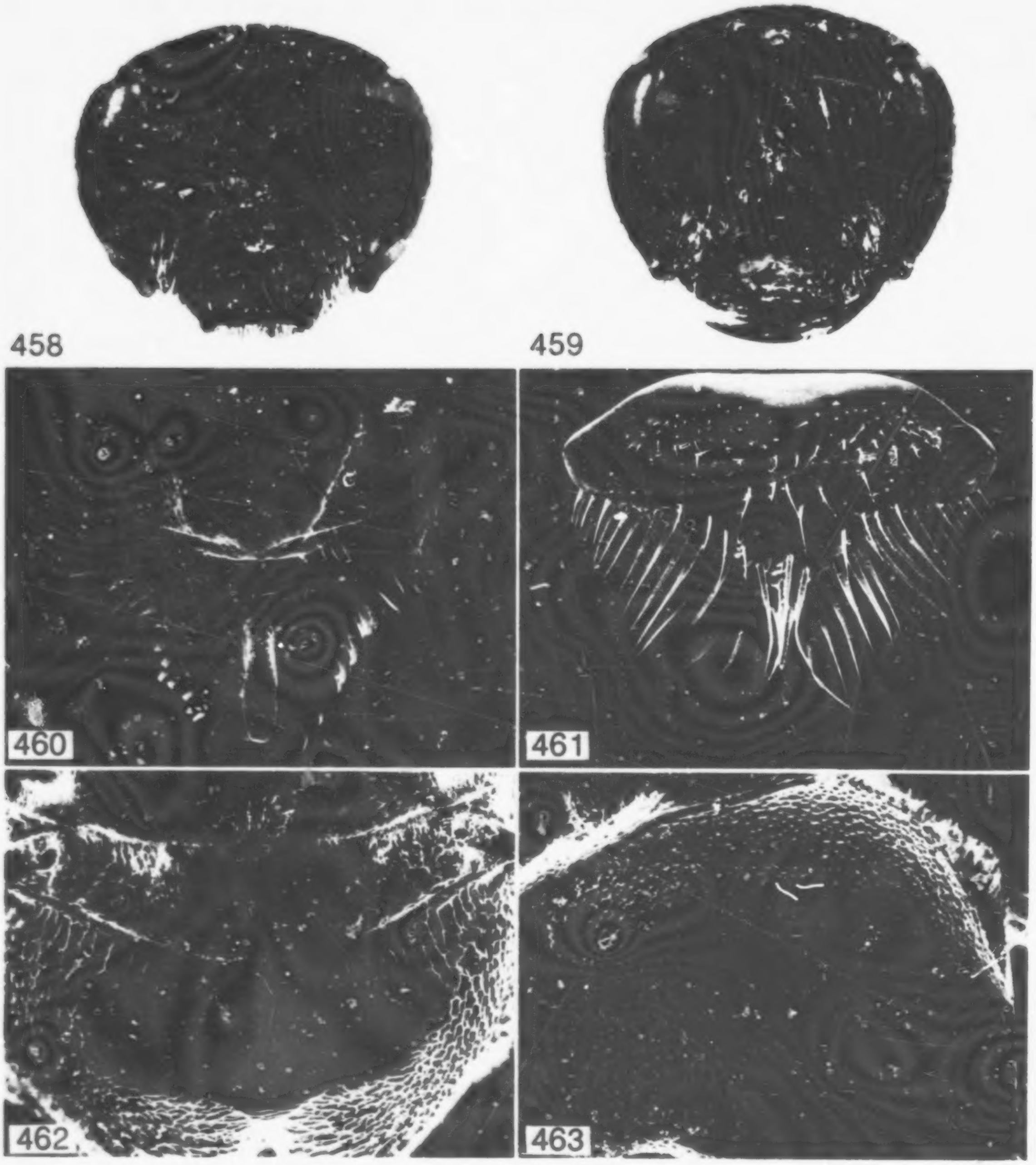
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FIGURES 458–463.—*Lasioglossum heterorhinum:* 458, female head; 459, male head; 460, female labrum; 461, male labrum; 462, female propodeum; 463, female mesoscutum.

0.92, $\bar{x} = 0.86$, $n = 15$). (5) Gena conspicuously wider than eye; (6) strongly produced posteriorly. (10) Clypeal surface shallowly depressed ventrally. Labrum as in Figure 461; (24) distal process developed as an elongate, acute projection; (25) basal area only moderately depressed medially; (26) basal lateral depressions well developed. (30) Mandible moderately elongate, reaching slightly beyond opposing clypeal angle. (53) Clypeus granulate along basal edge, apical two-thirds polished; (54) punctation somewhat uniform throughout, punctures over apical two-thirds slightly less dense than basal punctures. (68) Clypeal maculation present (Figure 459). (69) Flagellum entirely dark or only slightly paler ventrally than on dorsum. (72) Tarsi dark, concolorous with tibiae.

Vestiture: Sternal vestiture as in Figure 464; (82) hairs on sternum IV moderately elongate, suberect; (83) sternum V with a median rosette of short hairs, posterior edge of sternum with broadly rounded and widely separated lateral hair lobes.

Terminalia: Sterna VII–VIII as in Figure 470; (85) sternum VIII with elongate, slender median process, process parallel-sided or with apex slightly broader than stem. Genitalia as in Figures 465–469; (86) gonobase moderately elongate; (87) gonostylus extremely broad and membranous basally, forming a basal collar as in Figure 468, abruptly tapering to a short, narrowly rounded apical portion (in some specimens the entire gonostylar area is highly convoluted and apparently distorted as in Figure 469); (89) retrorse membranous lobe very slender (unlike other species, except *L. lampronotum,* apex of gonocoxite near base of retrorse lobe conspicuously hairy); (90) volsella with prominent lateral lobe.

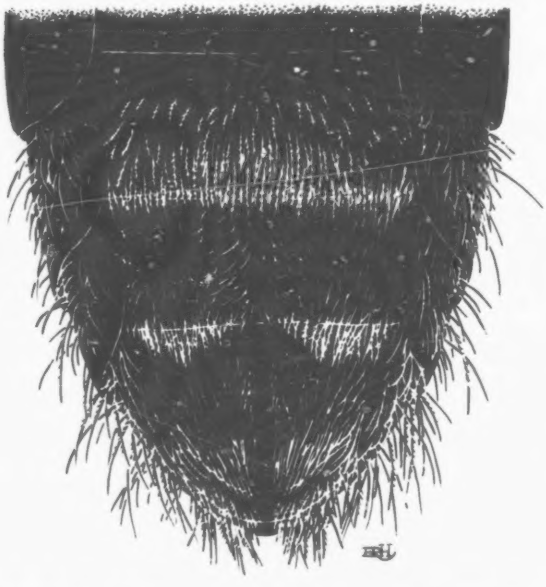


FIGURE 464.—*Lasioglossum heterorhinum,* male sternal vestiture.

FLIGHT RECORDS (Figure 471).—Females of *L. heterorhinum* have been collected from March through October, with most records from late June. All of the March records are from Cochise Co., Arizona; the September and October records, also from Arizona, are from Cochise and Santa Cruz counties. Most male records are from April but range from February (Veracruz, Mexico) to June.

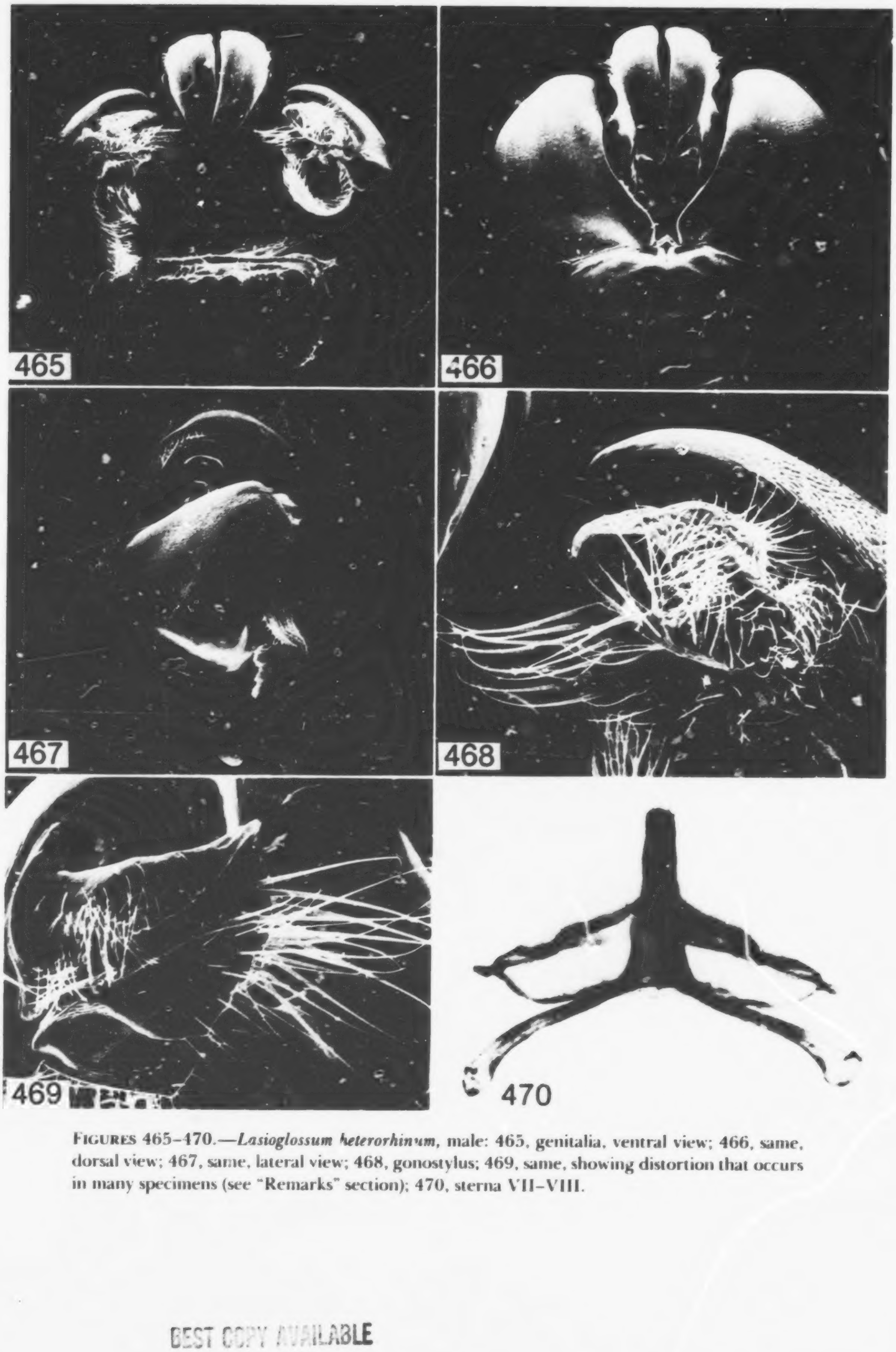
FLOWER RECORDS.—Females (53): Compositae 47%; Rosaceae 17%. Total: 53 in 13 families, 17 genera as follows:

**Arctostaphylos* 1(1)♀; **Asclepias* 1(1)♀; *Atriplex* 2♀; *Berberis* 3♀; *Brassica* 1♀; *Ceanothus* 1♀; **Cercocarpus* 1(1)♀; **Cimicifugo* (1)♀ (collecting pollen, O. Pellmyr, pers. comm.); *Erigeron* 27♀; *Geranium* 1♀; *Pentstemon* 3♀; **Phacelia* 1(1)♀; **Potentilla* (1)♀; *Purshia* 2♀; *Ranunculus* 2♀; **Salix* 3(2)♀; *Trifolium* 2♀.

SPECIMENS EXAMINED.—201 (182♀, 19♂).

MEXICO. HIDALGO: Laredo Highway (Baranca de San Vicente), 9 Aug 1957, 7000 ft, R.M. Straw, D.P. Gregory (2♀; OrS). VERACRUZ: Perote, 5 mi SW, 29 Feb 1972, F. Parker, D. Miller (1♂; USU).

UNITED STATES. ARIZONA: *Cochise Co.; Coconino Co.; Gila Co.:* Parker Creek (Sierra Ancha), Workman Creek; *Graham Co.:* Graham Mountains; *Mohave Co.:* Hualapi Mountain Park (14 mi SE Kingman); *Navajo Co.:* Kayenta; *Pima Co.:* Santa Catalina Mountains; *Santa Cruz Co.:* Madera Canyon (Santa Rita Mountains), Mt. Wrightson. COLORADO: *Boulder Co.:* Boulder; *El Paso Co.:* Manitou; *La Plata Co.:* Arboles; *Larimer Co.; Las Animas Co.:* Starkville; *Mesa Co.:* Mud Springs; *Moffat Co.:* Dinosaur, 12 mi N; *Montezuma Co.:* Mesa Verde; *Montrose Co.:* Buckeye Reservoir. NEVADA: *Humboldt Co.:* Winnemuca. NEW MEXICO: *Catron Co.:* Bursum Camp (18 mi E



FIGURES 465–470.—*Lasioglossum heterorhinum*, male: 465, genitalia, ventral view; 466, same, dorsal view; 467, same, lateral view; 468, gonostylus; 469, same, showing distortion that occurs in many specimens (see "Remarks" section); 470, sterna VII–VIII.

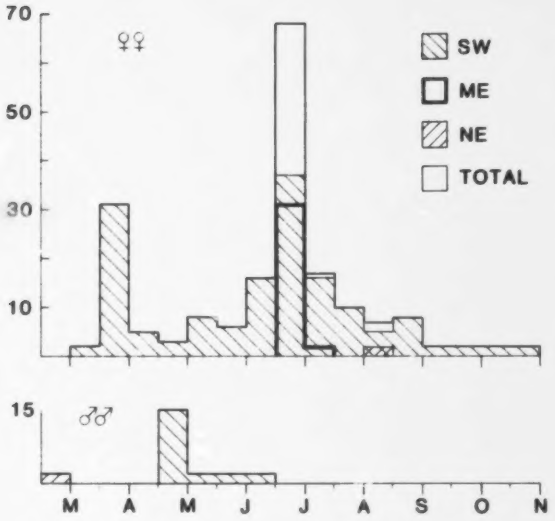


FIGURE 471.—*Lasioglossum heterorhinum* flight records.

Alma); *Grant Co.:* Silver City, 14 mi N, Willow Creek area (Gila National Forest); *Otero Co.:* Cloudcroft; *Rio Arriba Co.:* Lake Burford; *Sandoval Co.:* Jemez Springs; *San Miguel Co.:* Pecos; *Santa Fe Co.:* Hyde State Park (8 mi NE Santa Fe), Santa Fe; *Socorro Co.*. Bear Trap Camp (28 mi SW Magdalena); *Torrance Co.:* Tajique. SOUTH DAKOTA: *Custer Co.:* Custer State Park; *Pennington Co.:* Black Hills, Spring Creek Camp (11 mi NE Hill City). UTAH: *Cache Co.:* Logan Canyon; *Garfield Co.:* Bryce National Park (Rim Road), Lonesome Beaver (Henry Mountains), Red Canyon Camp (11 mi SE Panguitch); *Grand Co.:* Moab, 10 mi SE; *Wayne Co.:* Hanksville, 24 mi S (Henry Mountains); *Weber Co.:* Ogden.

23. *Lasioglossum jubatum* (Vachal)

FIGURES 35, 472–483

Halictus jubatus Vachal, 1904:474 [female].—Cockerell, 1905a:90 [key].

Lasioglossum jubatum.—Moure and Hurd, 1986:62 [catalog].

TYPE MATERIAL.—The female holotype is labeled

Museum Paris Mexique, coll. O. Sichel 1867/Mex[ico] [illegible word, probably Sichel] [18]64 [handwritten]/Holotype [handwritten on red label]/jubatus Vach[al] [handwritten]/ Halictus jubatus Vach.[al] [handwritten].

This specimen, in the Paris Museum (MNHNP), is missing the fifth tarsomere of the left hind leg and some thoracic hairs are matted, but is otherwise in excellent conditon. The small pin holes in both pleural walls indicate that the type was originally double-mounted and later repinned dorsoventrally.

DISTRIBUTION (Figure 472).—*Lasioglossum jubatum* is a wide-ranging species known from southeastern Arizona, scattered localities throughout Mexico south to Chiapas, Guatemala, and El Salvador. Twelve males are only tentatively associated with this species and are therefore mapped separately (see "Remarks" section). The localities herein reported from Cochise County, Arizona, are the first records of this species north of the Mexican border.

DIAGNOSIS.—The pale orange to golden hairs of the vertex, pronotum, mesoscutum, scutellum, and metanotum that sharply contrast with the white pubescence of the rest of the head, thorax, and abdomen will distinguish *Lasioglossum jubatum* from all other known New World *Lasioglossum*. Additional characters helpful in recognizing *L. jubatum* are the short head (Figure 473, length/width ratio 0.74–0.92, $\bar{x} = 0.84$), granuloso-punctate mesoscutum (Figure 477), and large acarinarium (Figure 478). The pronotal lateral ridge shows some variability in being complete (as in Figure 9) or obscurely notched.

The tentatively associated males can be distinguished from all other know *Lasioglossum* males by the elongate, rounded, and widely separated hair lobes on the posterior edge of sternum V (Figure 483). Other helpful characters are the short head, complete to virtually complete pronotal lateral ridge, and the conspicuous apicomedial depression of the clypeal surface.

DESCRIPTION.—FEMALE: (1) Length 7.8–10.0 mm ($\bar{x} = 9.1$, $n = 15$); (2) wing length 2.4–2.7 mm ($\bar{x} = 2.6$, $n = 15$); (3) abdominal width 2.6–3.1 mm ($\bar{x} = 2.8$, $n = 15$).

Structure: (4) Head short (Figure 473, length/width ratio 0.74–0.92, $\bar{x} = 0.84$, $n = 15$). (7) Supraclypeal area evenly rounded, (8) moderately protuberant. (9) Clypeus projecting approximately 0.79 of its length below lower margin of eyes; (11) surface with narrow to broad

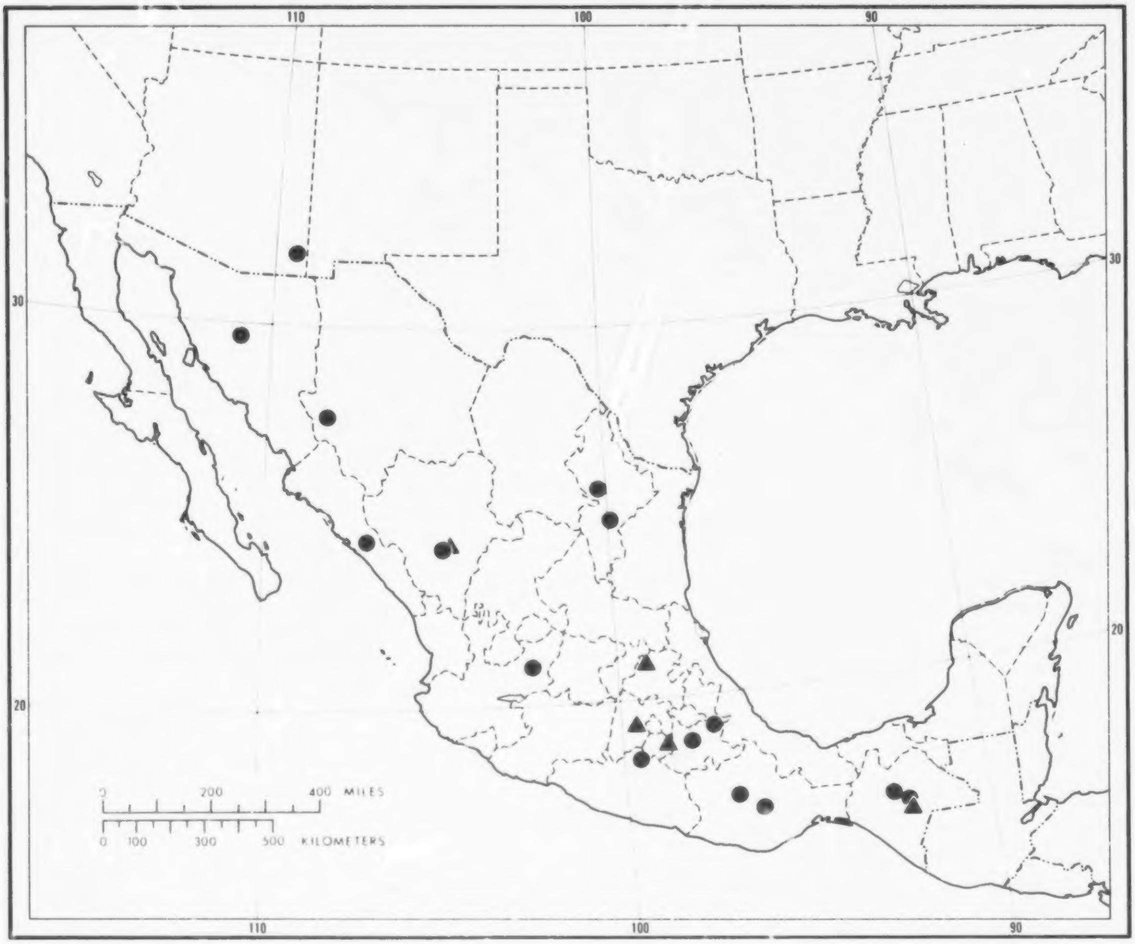
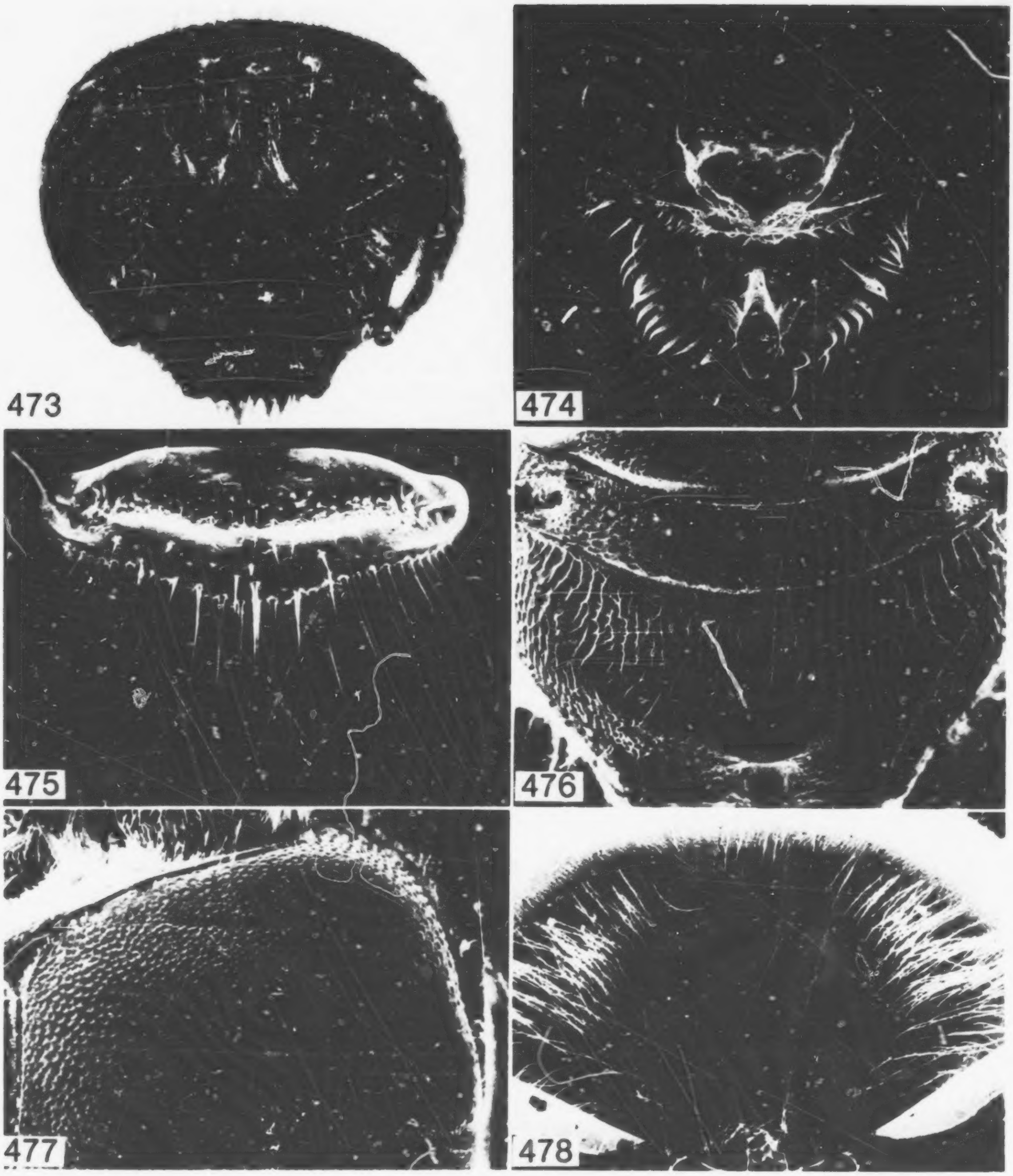


FIGURE 472.—Distribution of *Lasioglossum jubatum* females (circles) and tentatively associated males (triangles).

median longitudinal sulcation. (14) Distance between lateral ocelli subequal to distance between lateral ocellus and eye. (23) Flagellomere 1 subequal in length to 2 along dorsal surface. Labrum as in Figure 474; (27) distal keel broad in frontal view, spoon-shaped; (28) distal lateral projections well developed, triangular, not sharply pointed; (29) fimbrial setae acutely pointed.

(32) Pronotal lateral angle broadly obtuse; (33) pronotal lateral ridge incomplete, obscurely interrupted by oblique lateral sulcus to virtually complete; (34) lower portion of lateral ridge sharply edged. (35) Mesoscutal lip very weakly bilobed, (33) moderately elevated from pronotum. (40) Dorsal surface of propodeum about 0.83 the length of scutellum and about 1.4 times the length of metanotum, (41) depressed centrally, (42) posterior margin broadly rounded; (43) propodeal triangle moderately well defined laterally, lateral rims absent, evident medially as a low V-shaped elevation; (44) lateral carinae very well developed but extending only slightly beyond midpoint of posterior surface. (45) Tibial spur as in Figure 35.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FIGURES 473–478.—*Lasioglossum jubatum:* 473, female head; 474, female labrum; 475, male labrum; 476, female propodeum; 477, female mesoscutum; 478, female acarinarium at base of tergum I.

(46) Lateral edge of metasomal tergum II weakly sinuate, nearly straight.

Sculpture: (47) Face moderately shiny, (48) densely and uniformly punctate between ocelli and antennae, punctures contiguous. (51) Supraclypeal area extremely granulate; (52) punctures separated by their width laterally, becoming very sparse centrally. (53) Clypeus granulate basally, apical half polished; (54) punctures separated by less than their width basally, less dense and obscure medially to apex, apicolateral areas impunctate. (56) Mesoscutum moderately shiny; (57) punctation as in Figure 477, granuloso-punctate laterally and anteriorly, less dense centrally, punctures 1–3 times their width apart. (58) Scutellum with sparse, fine punctation adjacent to median line, punctures 1–3 times their width apart. (63) Dorsal surface of propodeum (Figure 476) ruguloso-striolate, striae reaching posterior margin; (64) surface obscurely alveolated. (65) Metasomal tergum I moderately shiny; (66) punctation fine, dense, punctures slightly less than their width apart.

Coloration: (71) Wing membrane hyaline.

Vestiture: (74) Pubescence of head white near antennae and on genae, becoming golden on vertex. (75) Pubescence of thorax white on pleuron, propodeum, metathorax and pronotal lobes; deep golden to pale orange on pronotum, mesoscutum and scutellum; (76) mesoscutal hairs dense, conspicuously plumose. (77) Hind tibial hair color differentiated, hairs mostly white, dorsal hairs dark brown basally, brown distally to apex. (78) Anterior hairs of metasomal tergum I and (79) basal hair bands of terga II–IV white. (80) Acarinarium present (Figure 478), a large circular, glabrous area surrounded laterally and dorsally by elongate fringe hairs, dorsal opening of acarinarium wide, width of opening slightly exceeding width of lateral hair fringe as seen in dorsal view.

MALE: Similar to female except as follows: (1) length 7.1–8.8 mm ($\bar{x} = 8.2$, $n = 10$); (2) wing length 2.0–2.7 mm ($\bar{x} = 2.3$); (3) abdominal width 1.8–2.3 mm ($\bar{x} = 2.1$). (4) Head short (length/width ratio 0.87–0.92, $\bar{x} = 0.90$). (5) Gena slightly wider than eye, (6) rounded, not produced posteriorly. (10) Clypeal surface conspicuously depressed apicomedially. Labrum as in Figure 475; (24) distal process moderately well developed, pointed; (25) basal area depressed medially; (26) basal lateral depressions present, weakly developed. (30) Mandible extremely elongate, reaching midway between opposing clypeal angle and eye. (53) Clypeus obscurely granulate, shiny; (54) punctures distinct basally, becoming poorly defined and scattered over apical two-thirds. (68) Clypeal maculation present. (69) Flagellum entirely dark. (72) Tarsi dark, concolorous with tibiae.

Vestiture: (75) Hairs on vertex, pronotum, mesoscutum, metanotum and scutellum white. Sternal vestiture as in Figure 483; (82) Hairs on sternum IV moderately elongate, suberect; (83) surface of sternum V with moderately short, suberect hairs, posterior edge with conspicuously elongate, rounded and well-separated hair lobes.

Terminalia: Sterna VII–VIII as in Figure 479; (85) median process of sternum VIII elongate. Genitalia as in Figures 480–482; (86) gonobase moderately elongate; (87) gonostylus elongate, slender; (89) retrorse membranous lobe moderately broad; (90) volsella with moderately produced lateral lobe.

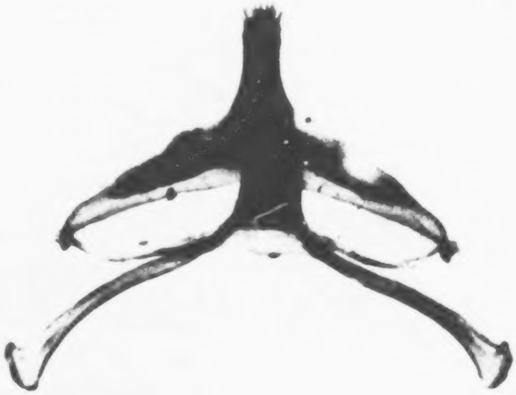
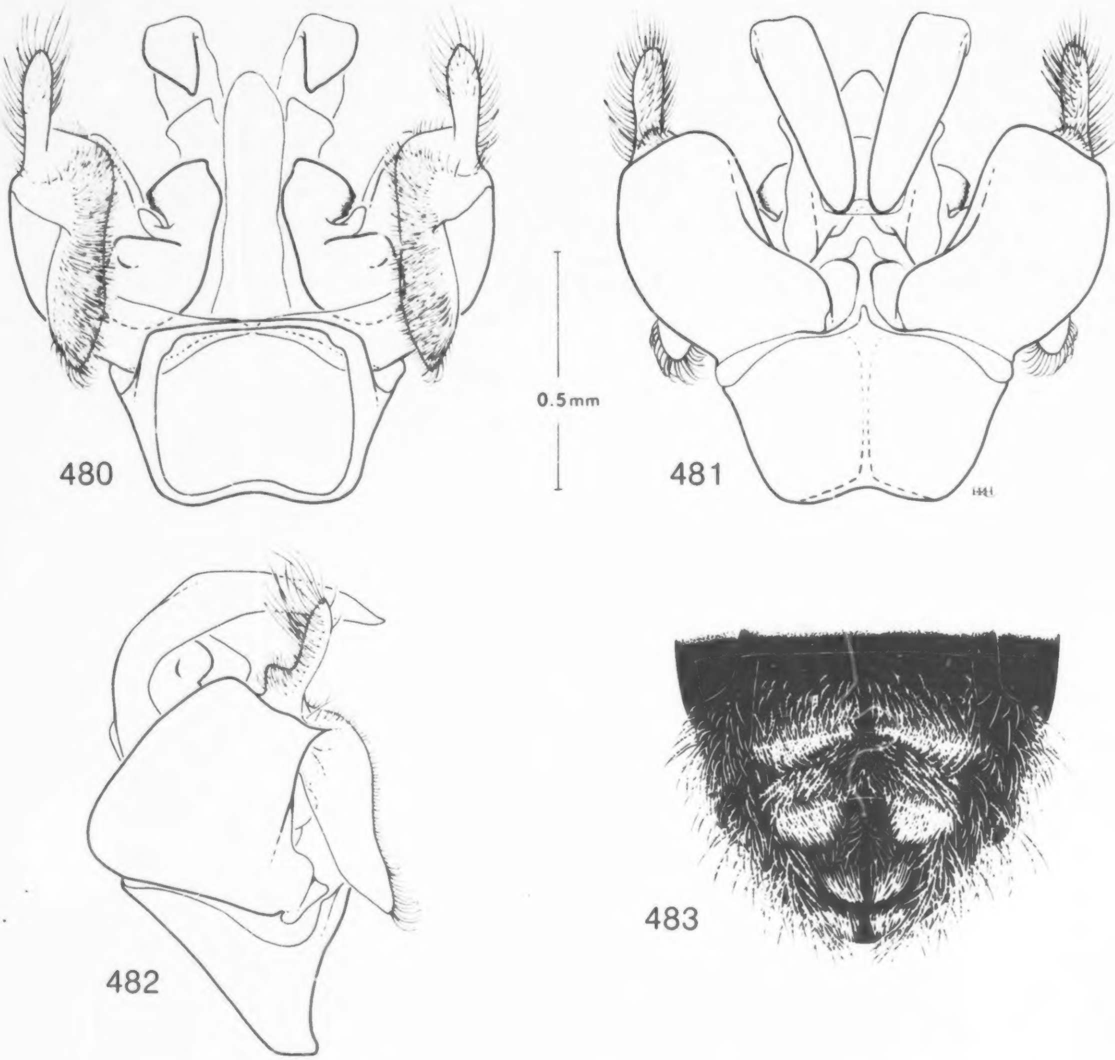


FIGURE 479.—*Lasioglossum jubatum*, male sterna VII–VIII.



FIGURES 480–483.—*Lasioglossum jubatum,* male: 480, genitalia, ventral view; 481, same, dorsal view; 482, same, lateral view; 483, sternal vestiture.

FLIGHT RECORDS.—Records for *L. jubatum* females range from March to October, with most records from June to August, with a peak in early July. Eleven of the 12 male records are from July through September; one male was taken on 16 February from the Mexican state of Morelos.

FLOWER RECORDS.—Females (17): Amaryllidaceae 71%; Compositae 24%. Total: 20 in 4 families, 6 genera as follows:

**Agave* 12(10)♀; *Aplopappus* 1♀; *Baccharis* 2♀, 1♂; *Bidens* 1♀; *Buddleia* 2♂; *Quercus* 1♀.

REMARKS.—The tentative sex association for *L. jubatum* is based primarily on the existence of two series of females and males taken from Chiapas and Chihuahua. Furthermore, the males (like females), have short heads, conspicuous clypeal depressions, and complete to virtually complete pronotal lateral ridges. Unlike the females, the mesoscutal hairs of the males are white and concolorous with the pleural vestiture (female mesoscutal hairs are diagnostically orange to gold).

SPECIMENS EXAMINED.—61 (49♀, 12♂).

EL SALVADOR. Cerro Verde, 23 Jul 1976, P. Bernhardt (1♀, CU).

GUATEMALA. Panajachel, Lake Atitlan, Solola, 6 Aug 1963, 5300 ft, Scullen, Bolinger (1♀; OrS).

MEXICO. Chiapas: Comitan, 16 mi NW, 3 Aug 1952, E.E. Gilbert, C.D. MacNeil (1♀; UCB); Matachic, 2 mi W, 7 Jul 1947, 6400 ft, Michener, (1♀; AMNH); Teopisca, 11 Aug 1963, 6200 ft, Scullen, Bolinger (1♀, 1♂, OrS). CHIHUAHUA: Temoris, 2 mi N, 22 Aug–2 Sep 1968, T.A. Sears, R.C. Gardner, C.S. Glaser (1♀; 5♂; UCD), 4 mi SE, 29 Aug 1969, T.A. Sears, R.C. Gardner, C.S. Glaser (1♀; UCD). DURANGO: Durango, 14 Aug 1947, 6200 ft, Gertsch (1♀; AMNH), 18 mi W, 7200 ft, 31 Jul 1964, J.A. Chemsak, J. Powell (2♂; UCB). GUERRERO: Taxco, 3.9 km NE, 16 Sept 1976, 1707 m, C.D. George, R.R. Snelling (1♀; LACM). HIDALGO: Jacala, 4500 ft, 1 Sep 1963, Scullen and Bolinger (1♂; OrS). JALISCO: La Piedad, 22 mi NW, 23 Jul 1954, J.W. MacSwain (1♀; UCB). MEXICO: Toluca, 15.5 mi E, 9500 ft, 6 Jul 1961, Univ. Kansas Mex. Exped. (1♂; KU). MORELOS: Huevapan, 16 Feb 1954, R.R. Dreisbach (1♂; KU). NUEVO LEON: Iturbide, 1 mi W, 28 Jul 1978, Plitt, Schaffner (1♀; TAM); Monterrey, 7.5 mi S, 21 Mar 1974, J.C. Schaffner (1♀; TAM). OAXACA: Mitla, 20–22 Aug 1963, 5600 ft, Scullen, Bolinger (5♀; OrS); Nochixtlan, 7 mi SE, 5 Jul 1953, Univ.[ersity of] Kansas Mex.[ican] Exped.[ition] (1♀; KU); Oaxaca, 14 mi E, 27 Jun 1961, 5000 ft, Univ. Kansas Mex. Exped. (9♀; KU). PUEBLA: Morelos Canada, 7 km SE, 4–5 Jul 1974, J. Chemsak, J. Powell (1♂; UCB); Puebla, 55 mi SE, 7 Jun 1956, 6600 ft, H.A. Scullen (3♀; OrS); Tepanco, 4 mi NW, 2 Jul 1953, Univ.[ersity of] Kansas Mex.[ican] Exped.[ition] (15♀; KU). SINALOA: Potrerillos, 21 Apr 1969, 4825 m, M.E. Irwin (1♀; UCR). SONORA: Santa Ana, 56 mi S, 1 Sep 1968, R.W. Thorp, J.T. Thorp (1♀; UCD).

UNITED STATES. ARIZONA: *Cochise Co.:* Douglas, 8 mi E, 19 Oct 1957, W.L. Nutting (1♀; UAT); Skeleton Canyon (Peloncillo Mts.), 24 Aug 1962, H.V. Weems (1♀; FSCA).

24. *Lasioglossum katyae*, new species

FIGURES 36, 395, 484

TYPE MATERIAL.—The female holotype is deposited in the Kansas University collection. It is in excellent condition and is labeled

COSTA RICA, Heredia Prov.[ince] 10 km. N. Heredia 25 July 1964 (Eickwort & Michener)/on Solanum tuberosum/ HOLOTYPE Lasioglossum katyae R.J. McGinley [red label].

Twelve female paratypes are also in the Cornell University Collection and one in the Oregon State Collection.

ETYMOLOGY.—This species is named after Kathleen P. Smith (Smithsonian Institution), who contributed to this study by photographing sterna VII–VIII of all *Lasioglossum* species and by translating Vachal (1904).

DISTRIBUTION (Figure 395).—Fourteen females of *L. katyae* are known to have been collected, 13 from Costa Rica and one from Guatemala.

DIAGNOSIS.—The large size (length 10.0–11.9, $\bar{x}$ = 10.5), doubly-punctate mesoscutum with black mesoscutal hairs, and infuscated anterior edge of the forewing (as in Figure 235) will distinguish *L. katyae* from all other New World *Lasioglossum*. See *L. eickworti* diagnosis for further details.

DESCRIPTION.—FEMALE: (1) Length 10.0–11.9 mm ($\bar{x}$ = 10.5, n = 12); (2) wing length 2.7–3.4 mm ($\bar{x}$ = 3.0, n = 12); (3) abdominal width 2.6–3.0 mm ($\bar{x}$ = 2.8, n = 12).

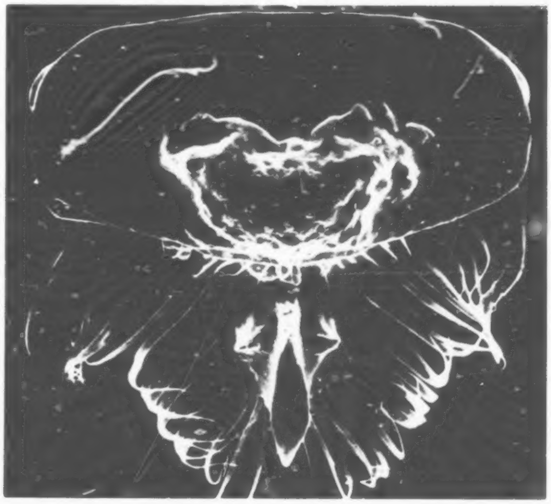


FIGURE 484.—*Lasioglossum katyae*, female labrum.

Structure: (4) Head moderately short (similar to Figure 396; length/width ratio 0.92–0.96, $\bar{x} = 0.94$, $n = 12$). (7) Supraclypeal area narrowly rounded dorsally along well-developed frontal carina, (8) area strongly protuberant. (9) Clypeus projecting approximately 0.88 of its length below lower margin of eyes; (11) surface without median longitudinal sulcation. (14) Distance between lateral ocelli exceeded by distance between lateral ocellus and eye. (23) Flagellomere 1 slightly shorter than 2 along dorsal surface. (24) Labrum as in Figure 484; (27) distal keel broad in frontal view, lateral edges bowed; (28) distal lateral projections small but distinct, sharply triangular and projecting forward as in *L. eickworti;* (29) fimbrial setae acutely pointed.

(32) Pronotal lateral angle very narrowly obtuse, sharply pointed; (33) pronotal lateral ridge incomplete, narrowly interrupted by oblique lateral sulcus; (34) upper portion of lateral ridge strongly carinate, lower portion broadly rounded. (35) Mesoscutal lip weakly bilobed, (36) moderately elevated from pronotum. (40) Dorsal surface of propodeum about 0.78 the length of scutellum and about 1.6 times the length of metanotum, (41) not depressed centrally, (42) posterior margin narrowly rounded; (43) propodeal triangle moderately well defined by low, median V-shaped elevation and carinate lateral rims, fading towards metanotum; (14) lateral carinae extending approximately two-thirds the length of posterior surface. (45) Tibial spur as in Figure 36.

(46) Lateral edge of metasomal tergum II broadly convex anteriorly, straight posteriorly.

Sculpture: (47) Face shiny, (48) densely punctate below ocelli, punctures contiguous, becoming only slightly less dense near antennae. (51) Supraclypeal area obscurely granulate, shiny; (52) punctures separated by 1–2 times their width laterally, becoming sparsely punctate centrally. (53) Clypeus mostly polished, granulate along basal edge; (54) punctures obscure basally, separated by less than their width, very sparse apically, separated by 1–4 times their width. (56) Mesoscutum moderately shiny; (57) doubly-punctate, smaller punctures separated by their width throughout, larger punctures separated by 3–4 times their width. (58) Scutellum nearly uniformly punctate, punctures fine, separated by 1–2 times their width. (63) Dorsal surface of propodeum strongly striate, striae not reaching posterior margin medially; (64) surface obscurely alveolated. (65) Metasomal tergum I moderately shiny; (66) punctation fine, dense, punctures separated by less than their width but not quite contiguous.

Coloration: (71) Wing membrane pale yellowish brown, anterior one-quarter to one-third infuscated.

Vestiture: (74) Pubescence of head brown. (75) Pubsecence of thorax mostly dark brown, hairs white on pronotal lateral angle and pronotal lobe, pale yellowish brown on propodeum; (76) mesoscutal hairs moderately dense, conspicuously plumose. (77) Hind tibial hair color differentiated, ventral hairs golden, dorsal hairs dark brown. (78) Anterior hairs of metasomal tergum I pale yellowish brown, (79) basal hair bands of terga II–IV yellowish white. (80) Acarinarium absent, anterior surface of tergum I with short, adpressed hairs surrounded laterally by elongate hairs. (81) Unlike most species, hair band of tergum II very narrow, covering at most basal 0.25 of tergum, hair bands of terga III–IV virtually absent, covering less than basal 0.25 of terga.

Flight Records.—One female was collected in late January, two in late June, and 11 in July.

Flower Records.—Six females taken off *Solanum tuberosum,* 10 km north of Heredia, Costa Rica. Three of these females had nearly full pollen loads.

Remarks.—*L. katyae* along with *L. eickworti* and *L. sandrae* probably comprise a natural taxon possibly deserving at least subgeneric status (see "Remarks" section for *L. eickworti*).

Specimens Examined.—14♀.

COSTA RICA. Cartago, 12 mi S, 21 Jul 1964, 2500 m, C.D. Michener (1♀; CU), 8 km NE, 13 Jul 1963, 5500 ft, C.D. Michener and party (1♀; CU); Cerro de la Muerte, 22 Jul 1964, 3300 m, R.B. & G. Roberts (2♀; CU); Heredia, 10 km N, 25 Jul 1964, G.C. Eickwort, C.D. Michener (6♀, includes holotype: CU, KU); Monteverde, 23 Jun 1981, S. Knapp (1♀: CU); Volcan Irazu (south slope), 28 Jun 1963, 8500 ft, C.D. Michener (1♀: CU); Volcan Poas (southeast slope), 15 Jul 1963, 6450 ft, Michener & Kerfoot (1♀: CU).

GUATEMALA. St. Maria (Highway 53), 29 Jan 1965, 5600 ft, Bolinger (1♀: OrS).

25. *Lasioglossum lampronotum*, new species

FIGURES 37, 485–490

TYPE MATERIAL.—The holotype female of *Lasioglossum lampronotum* is deposited in the Snow Museum, University of Kansas, Lawrence. The specimen is an excellent condition and is labeled.

21 mi. S.W. Prescott, [Yavapai County] Ariz.[ona] VII [July] -17-1950 C.D. Michener/Taken on Mentzelia pumila/HOLOTYPE Lasioglossum lampronotum R.J. McGinley [red-label].

Sixty-three female paratypes and 10 male paratypes listed in the "Specimens Examined" section are designated.

ETYMOLOGY.—The specific epithet is derived from the Greek *lampros* (bright, brilliant) plus *notos* (back), a reference to the shiny mesoscutum characteristic of this species.

DISTRIBUTION (Figure 485).—*Lasioglossum lampronotum* is known from Arizona, southern California, Nevada, and Utah.

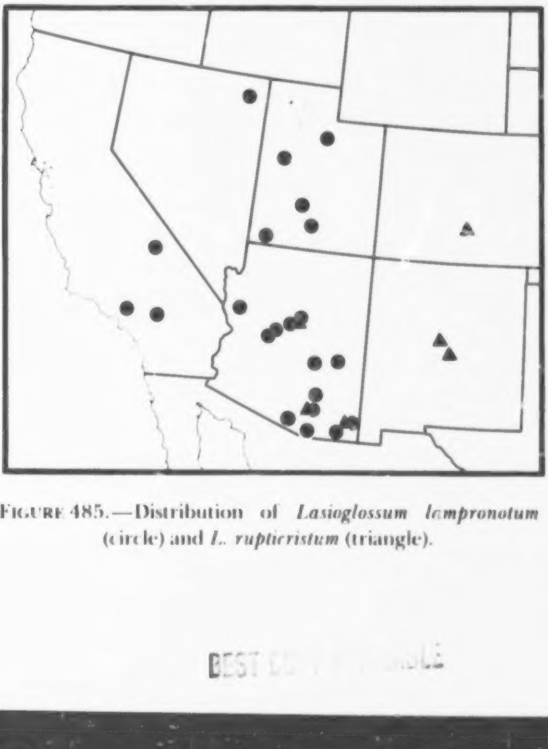


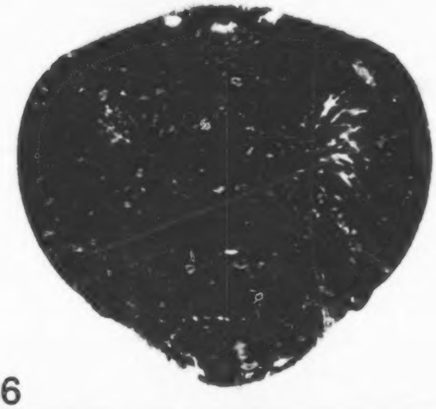
FIGURE 485.—Distribution of *Lasioglossum lampronotum* (circle) and *L. rupticristum* (triangle).

DIAGNOSIS.—*Lasioglossum lampronotum* can be recognized by the combination of its pale yellowish orange tarsi and hind tibiae, its short head (Figure 486), complete pronotal lateral carina, and shiny mesoscutum with dense but distinct punctures (Figure 490). It is most similar to *L. heterorhinum* but differs in having a polished clypeus (conspicuously granulate basally in *L. heterorhinum*), different mesoscutal punctation (*L. heterorhinum* mesoscutum dull, granuloso-punctate anteriorly, Figure 463) and pale leg color (legs entirely dark in *L. heterorhinum*). *Lasioglossum rupticristum* is also similar but differs in having an incomplete pronotal lateral carina as well as having entirely dark legs. See *L. heterorhinum* "Diagnosis" for further details.

DESCRIPTION.—FEMALE: (1) Length 7.8–9.6 mm ($\bar{x} = 8.7$, $n = 15$); (2) wing length 2.4–2.8 mm ($\bar{x} = 2.6$, $n = 15$); (3) abdominal width 2.4–2.8 ($\bar{x} = 2.7$, $n = 15$).

Structure: (4) Head short (Figure 486; length/width ratio 0.76–0.88, $= 0.81$, $n = 15$). (7) Supracylpeal area evenly rounded, (8) very weakly protuberant. (9) Clypeus projecting approximately 0.65 of its length below lower margin of eyes; (11) surface without median longitudinal sulcation. (14) Distance between lateral ocelli subequal to distance between lateral ocellus and eye. (23) Flagellomere 1 slightly shorter than 2 along dorsal surface. (24) Labrum as in Figure 488; (27) distal keel broad as seen in frontal view, slightly widest basally; (28) distal lateral projections well developed, triangular, and sharply pointed; (29) fimbrial setae acutely pointed.

(32) Pronotal lateral angle narrowly obtuse; (33) pronotal lateral ridge complete (broad lateral sulcus reaching ridge but not distinctly interrupting it); (34) lower portion of lateral ridge sharply edged. (35) Mesoscutal lip weakly bilobed, (36) moderately elevated from pronotum. (40) Dorsal surface of propodeum about 0.78 the length of scutellum and about 1.4 times the length of metanotum, (40) slightly depressed centrally, (42) posterior margin broadly rounded; (43) propodeal triangle weakly defined, evident



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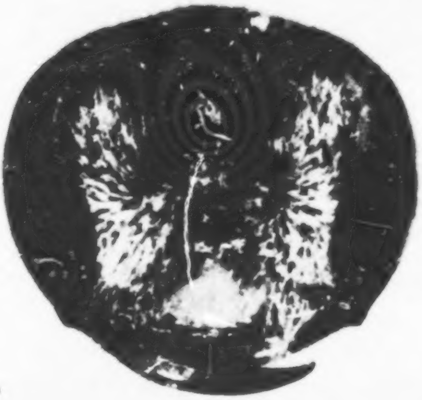

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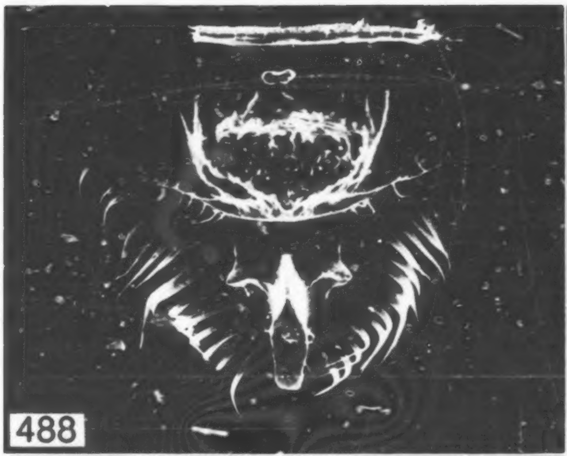

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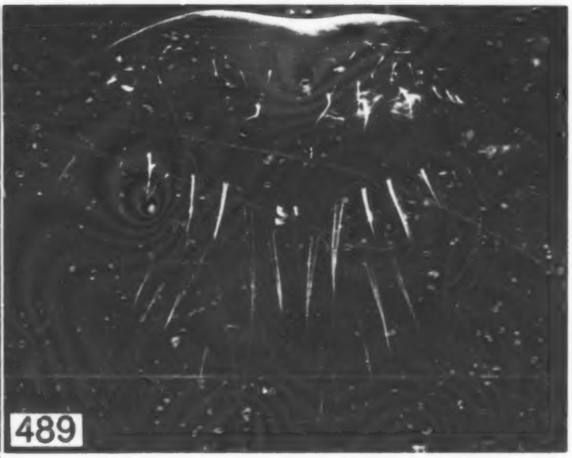

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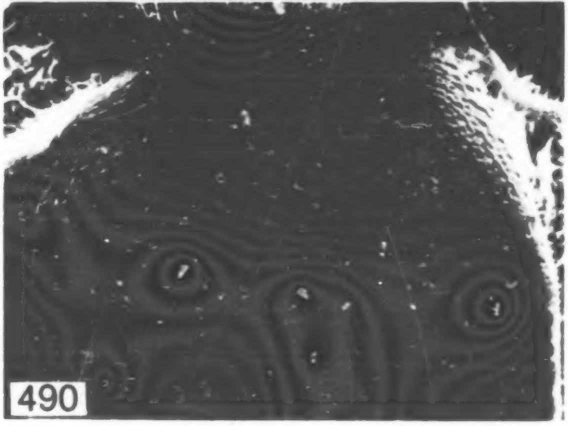

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FIGURES 486–490.—*Lasioglossum lampronotum:* 486, female head; 487, male head; 488, female labrum; 489, male labrum; 490, female mesoscutum.

medially as a low, inconspicuous, V-shaped elevation, lateral rims absent; (44) lateral carinae extending at most to midpoint of posterior surface. (45) Tibial spur as in Figure 37.

(45) Lateral edge of metasomal tergum II weakly sinuate, nearly straight.

Sculpture: (47) Face shiny, (48) densely punctate below ocelli, punctures contiguous, becom-

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ing only slightly less dense near antennae. (51) Supraclypeal area weakly granulate. (52) uniformly and densely punctate, punctures separated by their width. (53) Clypeus polished, obscurely granulate basally; (54) punctures separated by less than their width basally and medially to apex, sparsely punctate apicolaterally. (56) Mesoscutum very shiny; (57) punctation as in Figure 490, punctures very dense laterally, nearly contiguous, becoming granuloso-punctate along anterior edge, only slightly less dense centrally, punctures at most 2 times their width apart. (58) Scutellum nearly uniformly punctate, punctation similar to that of mesoscutum. (63) Dorsal surface of propodeum ruguloso-striolate laterally, becoming mostly rugulose medially (similar to that of *L. heterorhinum*, Figure 462); (64) surface obscurely alveolated. (65) Metasomal tergum I moderately shiny; (66) punctation fine, dense, punctures slightly less than their width apart.

Coloration: (71) Wing membrane hyaline. (72) Unlike most species, mid and hind tarsi, hind tibiae and distal quarter of mid tibiae usually pale yellowish orange (see "Remarks" section).

Vestiture: (74) Pubescence of head white. (75) Pubescence of thorax white to yellowish white; (76) mesoscutal hairs moderately dense and plumose. (77) Hind tibial hairs concolorous, yellowish white. (78) Anterior hairs of metasomal tergum I and (79) basal hair bands of terga II–IV white. (80) Acarinarium absent, elongate hairs scattered over anterior surface of tergum I.

MALE: Similar to female except as follows: (1) length 7.0–7.8 mm ($\bar{x}$ = 7.4, n = 2); (2) wing length 2.0–2.1 mm ($\bar{x}$ = 2.1, n = 2); (3) abdominal width 1.8–1.9 mm ($\bar{x}$ = 1.9, n = 2). (4) Head as in Figure 487 (length/width ratio 0.82, $\bar{x}$ = 0.82, n = 2). (5) Gena narrower than eye, (6) strongly produced posteriorly, angulate. (10) Clypeal surface shallowly depressed ventrally. Labrum as in Figure 489; (24) distal process developed as an elongate, acute projection; (25) basal area only moderately depressed medially; (26) basal lateral depressions moderately developed. (30) Mandible moderately elongate, reaching just beyond opposing clypeal angle. (53) Clypeus polished; (54) punctures well formed and dense basally, apical two-thirds sparsely punctate with mixture of very fine and larger, poorly defined punctures. (69) Flagellum paler on venter than on dorsal surface. (72) Tarsi yellowish white. Vestiture and terminalia as described for *L. heterorhinum*.

FLIGHT RECORDS.—*Lasioglossum lampronotum* females have been collected from March through August. The one female taken in March was from Cochise County, Arizona; the one April record was from Mohave County, Arizona. The three known males were taken in July, August, and September.

FLOWER RECORDS.—Females (26): Solanaceae 38%; Loasaceae 31% Rosaceae 12%. Male (1): Compositae 100%. Total: 27 in 8 families, 10 genera as follows:

Agave 1♀; *Astragalus* 1♀; *Baccharis* 1♀; *Cowania* 3♀; **Mentzelia* 8(8)♀; *Nicotiana* 1♀; *Phacelia* 1♀; *Salvia* 1♀; *Senecio* 1♂; *Solanum* 9♀.

REMARKS.—The tarsi and hind tibiae of most *Lasioglossum lampronotum* specimens are conspicuously pale yellowish orange but there is some variability in this feature. Five of the 60 females examined had at least partially darkened hind legs: three females from Wild Rose Canyon, Inyo County, California, had the tarsi and tibiae of all legs darkly pigmented; one female from Box Canyon and another from the Santa Catalina Mountains, Pima County, Arizona, had just the hind tibiae darkly pigmented.

SPECIMENS EXAMINED.—74 (64♀, 10♂).

UNITED STATES. ARIZONA: *Cochise Co.:* Bisbee, 2 mi W, 30 Jul 1959, 6000 ft, H.E. Evans (1♀; CU); Chiricahua Mountains, 4 Jul 1940, L.J. Lipovsky (1♀; KU), 20 Jul 1955, D.J. & J.N. Knull (1♀; OhS); Cave Creek Ranch (1 mi S Portal), 3 Aug 1969, E.G. Linsley (2♀; UCB); Peloncillo Mountains, 24 Aug 1962, 4500–5000 ft, H.V. Weems, Jr. (1♀; FSCA), Southwestern Research Station (5 mi W Portal), 8–19 Jul 1956, C. & M. Cazier, E. Ordway (3♀; AMNH), 8 Mar 1957, E. Ordway (1♀; AMNH), 8 Jul 1963, J.G. Rozen, D.K. Oliver, A.R. Moldenke, J.A. Woods (3♀; AMNH). *Coconino Co.:* Sedona, 20 Jun 1964, R.S. Beal (1♀; NAU), 6.5 mi N (Oak Creek Canyon), 2 May 1973, F. Parker, G. Bohart, P. Torchio (7♀; USU). *Gila Co.:* Parker Creek (Sierra

Ancha), 20 Apr 1947, H. & M. Townes (1♀; KU). *Mohave Co.:* Boulder Dam, 28 Apr 1972, G. Bohart, F. Parker, P. Torchio (1♀; USU); Hualpai Mountain Park, 9 Aug 1952, 5100 ft, F. Werner, J. Bequaert (1♀; UAT); Hualapai Mountains, 30 Jun 1966, D.S. Horning, Jr. (1♀; UIM). *Navajo Co.:* Whiteriver, 21 Jun 1957, G. Butler, F. Werner (1♀; UAT). *Pima Co.:* Baboquivari Mts., 10 Aug 1924, O.C. Poling (1♂; CAS); Box Canyon, 12 Aug 1978, M. Ivie (1♀; MI); Santa Catalina Mountains, 15 Jul 1950, L.D. Beamer (1♀; KU), no date, J.L. Neff (1♀; CU). *Pinal Co.:* Oracle, 11 Aug 1950, R.S. Beal (1♀; NAU). *Santa Cruz Co.:* Acanelo (1♀; UAT); Madera Canyon, 15 Jul 1963, V.L. Vesterby (1♀; UCD). *Yavapai Co.:* Jerome, 4 mi S, 7 Jul 1952, R.H., L.D. Beamer, W. LaBerge, C. Liang (1♂; KU); Kirkland (Peeples Valley), 22–24 Aug 1927 (1♀; CU); Prescott, 29 Jul 1933, J.D. Beamer (1♀; KU), 21 mi SW, 17 Jul 1950, C.D. Michener (8♀, includes holotype; KU).

CALIFORNIA: *Inyo Co.:* Frenchman's Canyon (Panamint Mts.), 21 Jun 1978, 6800–7200 ft, T. Griswold (1♀; TG); Wild Rose Canyon (Panamint Mts.), 19 Jun 1937, 7500 ft, C.D. Michener (3♀; KU). *Los Angeles Co.:* Crystal Lake, 9 Jul 1952, J. Linsley, A.T. McClay (3♀; UCB, UCD). *San Bernardino Co.:* Baldwin Lake, 2 mi NE, 17 May 1969, 6200 ft, E.I. Schlinger (1♀; UCB); Hanna Flats, San Bernardino Mts., May 1958, C.A. Allen (1♂; UCR); Lucerne Valley, 13 mi SE, 2 Aug 1969, 5000 ft, D.P. Levin (1♂; LACM); Mt. Home Camp, 29 Sep 1955, 4000 ft, A.L. Melander (1♂; USNM); Seven Oaks, 21 Sep 1952, A.L. Melander (1♂; USNM); Snow Crest Camp, 7 Jul 1952, H.L. Mathis, D.S. Thompson, W.V. Garner (5♀; UCD); upper Santa Ana River, 31 Aug 1946, G.H., J.L. Sperry (1♂; KU), 12 Aug 1953, A.L. Melander (2♂; USNM). NEVADA: *Elko Co.:* Pequop Summit, 26 Jun 1955, J.C. Downey (1♀; UCD). UTAH: *Garfield Co.:* Calf Creek, 30 Jul 1982, T. Griswold, F. Parker (1♀; USU); Escalante, 11 mi E, 5 Jun 1966, G.E. Bohart (1♀; USU). *Juab Co.:* Topaz Mountain, 7–9 Jun 1983 (2♀; USU). *Piute Co.:* Circleville, 1–8 May 1973, W.P. Nye (1♀; USU). *Wasatch Co.:* Heber, 15 Sep 1958, G.E. Bohart (1♂; USU). *Washington Co.:* Leeds Canyon, 15 Jul 1980, Hanson, Knowlton, Clemons (1♀; USU).

26. *Lasioglossum leucozonium* (Schrank)

FIGURES 38, 204, 491–503

Apis leucozonia Schrank, 1781:406.

Halictus similis Smith, 1853:69 [female].—Dalla Torre, 1896:84.—Cockerell, 1905b:352 [taxonomic notes]; 1909:334.

Halictus leucozonius.—Dalla Torre, 1896:66 [World catalog; covers older literature].—Atwood, 1933:449 [biology].—Sandhouse, 1933:78 [taxonomic notes].

Lasioglossum leucozonium.—Michener, 1951:1106 [Nearctic catalog].—Evans and Lin, 1959:127, 130 [predators, *Philanthus bilunatus* Cresson, *P. solivagus* Say].—Mitchell, 1960:338, 344 [key, redescription].—Knerer and Atwood, 1962:163 [locality and flower records].—Knerer, 1968:83; 1969:141–144 [biology notes].—Knerer and MacKay, 1969:290–293.—Evans, 1975:891 [predator, *Philanthus albopilosus* Cresson].—Hurd, 1979:1957 [Nearctic catalog].—Duffield et al., 1981:323 [Dufour's gland chemistry].

TYPE MATERIAL.—The type of *Apis leucozonia* was not examined. The female holotype of *Halictus similis*, in the British Museum (Natural History), is labeled

Type H.T. [on circular label with orange-red border]/B.M. TYPE HYM. 17a.995/B.M. TYPE HYM. Halictus similis Smith 1853/similis Sm[ith] Type [handwritten].

The specimen is in fair condition, missing both antennae, the left front leg, the distal tarsomere of the left hind leg, and the tarsus of the right hind leg.

DISTRIBUTION (Figure 491).—*Lasioglossum leucozonium* is a holarctic species, widespread in Europe. In the New World, *L. leucozonium* occurs from Cape Breton Island south to New Jersey and west to Wisconsin. An isolated record is one female collected in 1974 from Blount Co., Tennessee (University of Kansas Collection). Future collecting in the Appalachians may produce more

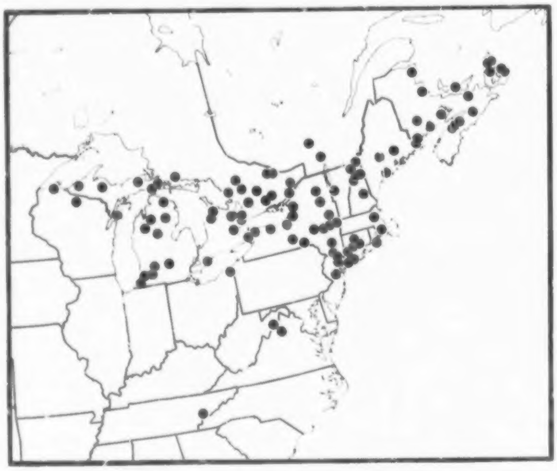


FIGURE 491.—New World distribution of *Lasioglossum leucozonium*.

southern records for this species.

Diagnosis.—In the eastern United States, *Lasioglossum leucozonium* and *L. zonulum* are the only female *Lasioglossum* that have a strongly striate to reticulate dorsal propodeal surface (Figures 496, 738; in other species the surface is smooth posteriorly, Figure 358, to completely ruguloso-striolate, Figure 438). The dorsal propodeal surface of both species is nearly unique in being conspicuously short, only slightly longer than the metanotum (*L. titusi*, a western species, has a similarly short propodeal surface, Figure 636). The first metasomal tergum of *L. leucozonium* is dull with well-developed punctures separated by 1–1.5 times their width (Figure 139; tergum shiny, punctures very fine and sparse in *L. zonulum*, Figure 138). The pronotal lateral angle of *L. zonulum* is more strongly projecting than that of *L. leucozonium* (Figures 497, 739), and the latter species can be further differentiated from *L. zonulum* and other *Lasioglossum* in having conspicuous transverse striations on the vertex behind the ocelli (Figure 140; striations absent or weakly developed in other species).

Males of *Lasioglossum leucozonium* have a dense patch of hairs on the posterior edge of sternum V and a unique inverted V-shaped hair patch on sternum VI (Figure 204). Other characters helpful in recognizing *L. leucozonium* males are the rounded clypeus and ventrally narrowed head (Figure 493), the coarsely rugose dorsal propodeal surface, and the yellow basitarsi of the middle and hind legs.

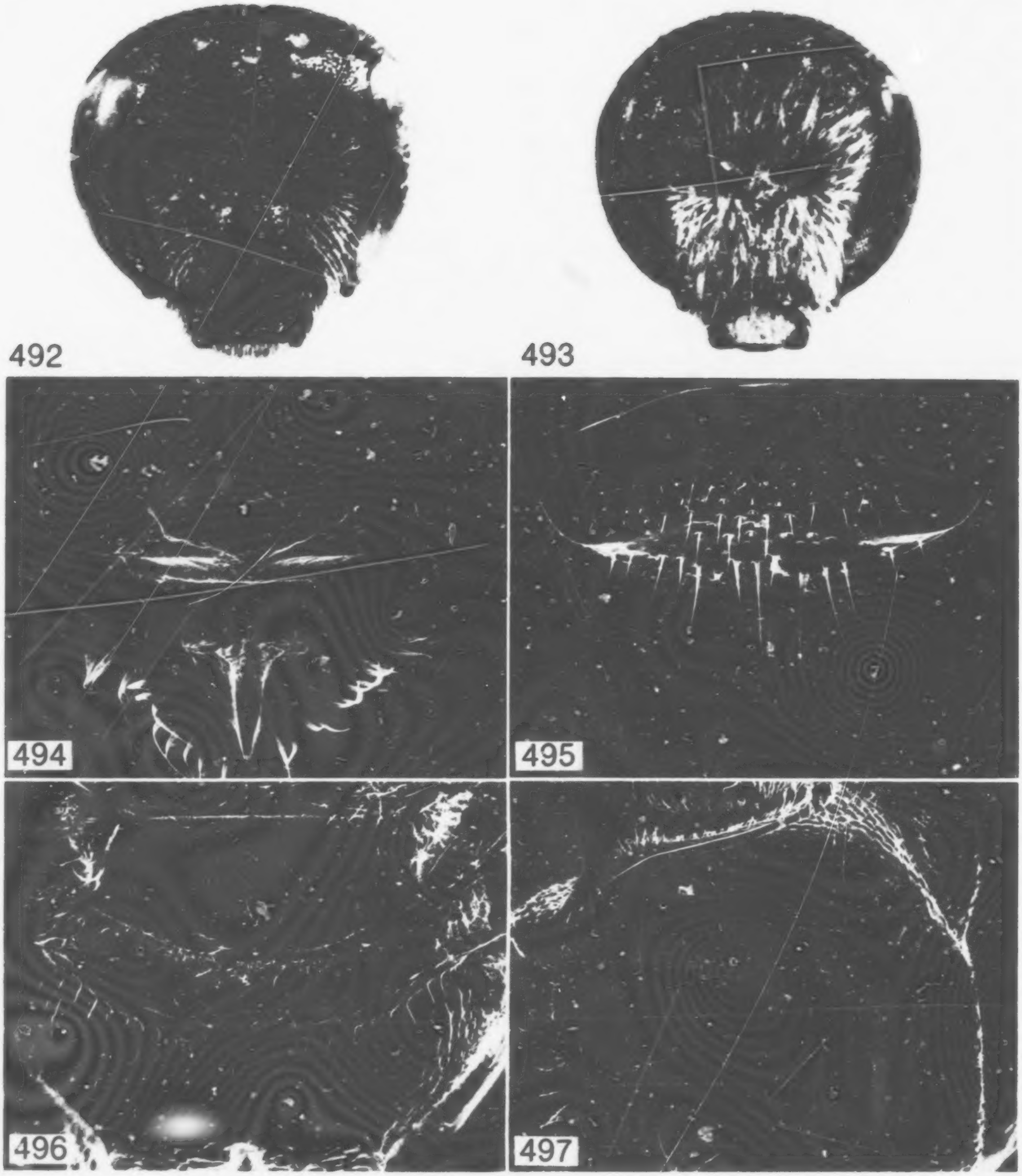
Description.—female: (1) Length 8.2–10.0 mm ($\bar{x} = 9.0$, n = 15); (2) wing length 2.2–2.5 mm ($\bar{x} = 2.4$, n = 15); (3) abdominal width 2.8–33. ($\bar{x} = 3.1$, n = 15).

Structure: (4) Head elongate (Figure 492; length/width ratio 0.88–0.96, $\bar{x} = 0.92$, n = 15). (7) Supraclypeal area evenly rounded, (8) very weakly protuberant. (9) Clypeus projecting approximately 0.86 of its length below lower margin of eyes; (11) surface without median longitudinal sulcation. (14) Distance between lateral ocelli exceeding distance between lateral ocellus and eye. (23) Flagellomere 1 longer than 2 along dorsal surface. Labrum as in Figure 494; (27) distal keel moderately broad in frontal view, gradually narrowing towards apex (similar to *L. zonulum*); (28) distal lateral projections moderately well developed, weakly projecting; (29) fimbrial setae acutely pointed.

(32) Pronotal lateral angle moderately obtuse (dorsal edge of pronotum well developed); (33) pronotal lateral ridge incomplete, broadly interrupted by oblique lateral sulcus; (34) lower portion of lateral ridge inconspicuous, broadly rounded. (35) Mesoscutal lip rounded, not bilobed, (36) strongly elevated from pronotum. (40) Dorsal surface of propodeum about 0.61 the length of scutellum and subequal in length to metanotum, (41) not depressed centrally, (42) posterior margin indistinctly truncated (lateral angles of dorsal surface gradually sloping from propodeal triangle); (43) propodeal triangle well defined by carinate rim; (44) lateral carinae extending to dorsal surface, becoming indistinct medially. (45) Tibial spur as in Figure 38.

(46) Lateral edge of metasomal tergum II only faintly sinuate, virtually straight.

Sculpture: (47) Face shiny, (48) densely punctate below ocelli, punctures contiguous, becoming larger and less dense near antennae. (51) Supraclypeal area extremely granulate; (52) uniformly and densely punctate, punctures separated by their width or less. (53) Clypeus shiny but obscurely granulate; (54) punctures dense, nearly contiguous basally and medially to apex, slightly less dense apicolaterally. (56) Mesoscutum moderately shiny, surface microscopically patterned; (57) punctation as in Figure 497, punctures coarse, separated by their width or less laterally, obscurely formed anteriorly, separated by 2–3 times their width centrally. (58) Scutellum nearly uniformly punctate, punctation similar to that of mesoscutum. (63) Dorsal surface of propodeum (Figure 496) strongly striate laterally, becoming reticulate medially, striae and rugae reaching posterior margin; (64) surface smooth, not alveolated. (65) Metasomal tergum I moderately shiny, granulate; (66) punctation well defined, punctures deep, separated by 1–1.5 times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FIGURES 492–497.—*Lasioglossum leucozonium:* 492, female head; 493, male head; 494, female labrum; 495, male labrum; 496, female propodeum; 497, female mesoscutum.

their width posteriorly, less dense anteriorly, separated by 1–2 times their width.

Coloration: (71) Wing membrane hyaline.

Vestiture: (74) Pubescence of head white to yellowish white. (75) Pubescence of thorax white to yellowish white with some brown hairs on scutellum; (76) mesoscutal hairs moderately dense, conspicuously plumose. (77) Hind tibial hair color weakly differentiated, most hairs pale yellowish brown, dorsal hairs light brown. (78) Anterior hairs of metasomal tergum I and (78) basal hair bands of terga II–IV white. (80) Acarinarium absent, elongate hairs scattered over anterior surface of tergum I.

MALE: Similar to female except as follows: (1) length 7.2–8.8 mm ($\bar{x}$ = 7.4, n = 15); (2) wing length 1.6–2.1 mm ($\bar{x}$ = 1.8, n = 15); (3) abdominal width 1.8–2.3 ($\bar{x}$ = 2.0, n = 15). (4) Head as in Figure 493 (length/width ratio 0.95–1.04, $\bar{x}$ = 0.98, n = 15). (5) Gena wider than eye, (6) rounded, not produced posteriorly. (10) Clypeal surface broadly rounded, not flattened or depressed. Labrum as in Figure 495; (24) distal process weakly developed, rounded; (25) basal area with small circular median depression, mostly evenly rounded; (26) basal lateral depressions weakly developed. (30) Mandible short, just reaching opposing clypeal angle. (53) Clypeus weakly granulate, shiny; (54) uniformly punctate throughout, punctures separated by less than their width. (68) Clypeal maculation present (Figure 493). (69) Flagellum entirely dark or with ventral surface slightly paler than dorsum. (72) Foretarsi entirely dark; middle and hind basitarsi yellowish white except for dark distal edges, contrasting with tibiae and other tarsal segments; bases of middle, hind, and usually foretibiae with pale basal maculation.

Vestiture: Sternal vestiture as in Figure 204; (82) hairs on sternum IV erect, elongate without noticeable pattern; (83) posterior half of sternum V with dense patch of conspicuous, adpressed hairs; (84) unlike other New World *Lasioglossum* species except *L. zonulum*, sternum VI with a highly characteristic hair pattern consisting of a unique, inverted V-shaped hair patch.

Terminalia: Sterna VII–VIII as in Figure 502; (85) sternum VII somewhat reduced, slender, similar to that of *L. zonulum;* sternum VIII without median process; like *L. zonulum,* sternal disc reduced, narrow. Genitalia as in Figures 498–501; (86) gonobase moderately short; (87) gonostylus large, flat, rounded apically (unlike most species except *L. zonulum,* gonostylus with only short, inconspicuous setae); (88) retrorse membranous lobe absent; (90) volsella with prominent lateral flange.

FLIGHT RECORDS (Figure 503).—In the New World, *Lasioglossum leucozonium* females have been collected from late May through October, with most records from early June. Most male records are from late July and August but range from June through October.

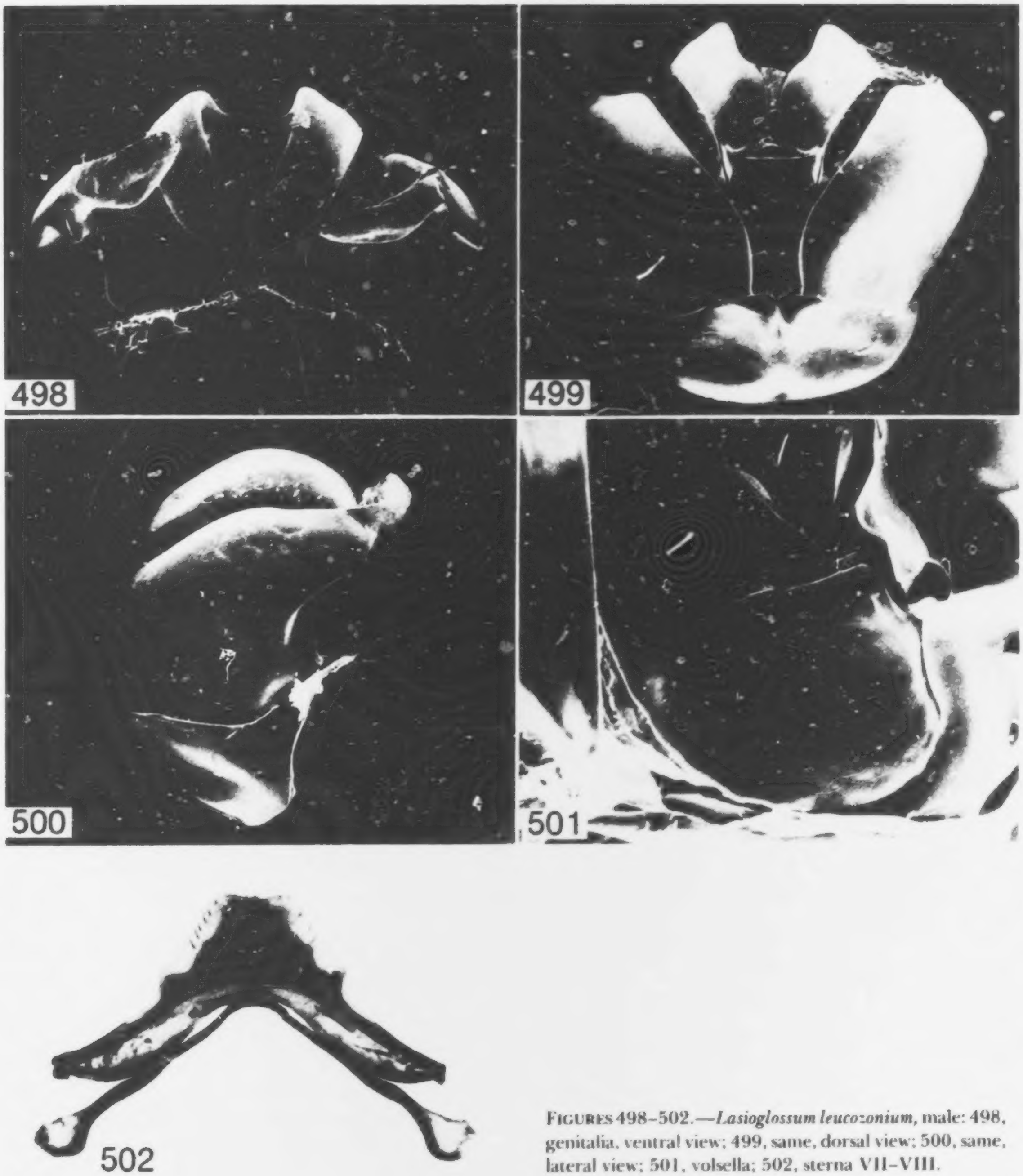
FLOWER RECORDS.—Floral label data suggests that *L. leucozonium* shows a preference for flowers of the Compositae; 89% of the female records and 64% of the male records were from composite genera. Of the 78 females noted to have scopal pollen loads, 74 (95%) were taken from members of this family (the exceptions were one female from *Campanula* and 3 females from *Rosa*). Males, unlike females, were also commonly found on *Melilotus* (80 records).

Summary: Females (212): Compositae 89%; Rosaceae 5%. Males (573): Compositae 64%; Leguminosae 16.4%; Polygonaceae 7%. Total: 785 in 13 familes, 34 genera as follows:

**Achiliea* 2(2)♀; *Anaphalis* 12♂; *Arctium* 7♂; *Aster* 1♀, 6♂; *Barbarea* 1♀; **Campanula* 3(1)♀; 2♂, **Centaurea* 7(2)♀, 8♂; *Chrysanthemum* 1♀; **Cichorium* 15(6)♀, 5♂; *Cirsium* 12♂; *Cornus* 2♀; *Cypripedium* 1♀; *Daucus* 34♂; *Epilobium* 2♂; *Erigeron* 1♀, 101♂, *Fagopyrum* 1♀, 40♂; *Helianthus* 1♀; **Hieracium* 123(44)♀; *Inula* 1♂; **Leontodon* 9(7)♀, 75♂; *Lotus* 1♀, 3♂; *Lythrum* 1♂; *Malus* 3♀; *Medicago* 1♀, 11♂; *Melilotus* 1♀, 80♂; *Ranunculus* 1♀, 5♂; **Rosa* 6(3)♀; *Rudbeckia* 1♀, 12♂; **Solidago* 23(13)♀, 128♂; *Sonchus* 4♀, 1♂; *Spiraea* 1♂; *Tragopogon* 1♀; *Trifolium* 2♀; *Verbena* 26♂.

SPECIMENS EXAMINED.—1740 (709♀, 1031♂).

CANADA. NEW BRUNSWICK: Fredericton, Fundy National Park, Grey's Mill, Halcomb, Hampton, Kouchibouguac, Nerepis, St. Andrews, St. John, Tracadie. NOVA SCOTIA: Baddeck, Cape Breton National Park, Cheticamp, Clyde River, Hantsport, Ingonish, Kempt Shore, Kentville, Kingport, MacNab's, Mt. Smoky, Pictou, Smith's Cove, Sydney, Truro, Windsor. ONTARIO: Algonquin Park, Bancroft, Boat Lake, Bobcaygeon, Bow Lake, Brown's Bay Provincial Park,



FIGURES 498–502.—*Lasioglossum leucozonium*, male: 498, genitalia, ventral view; 499, same, dorsal view; 500, same, lateral view; 501, volsella; 502, sterna VII–VIII.

Burlington, Calabogie, Caledon, Carnarvon, Cawaja Beach, Coderich, Cooksville, Fonthill, Forks of Credit, Guild, Hepworth, Inverhuron, Keswick, Leaside, Leith, Mallorytown, Marmora, North Bay, Ottawa, Owen Sound, Port Elgin, Queenston, Sauble Falls Provincial Park, St. Catharines, St. Lawrence Island National Park, Thessalon, Thorold, Toronto. PRINCE EDWARD ISLAND: Stanhope, Prince Edward Island National Park. QUEBEC: Gatineau Park, Hudson

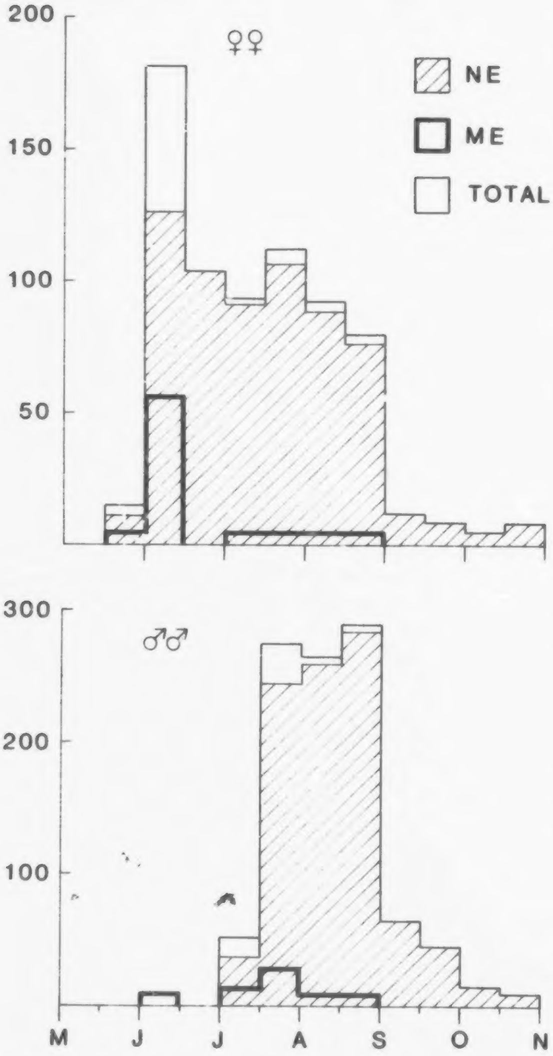


FIGURE 503.—*Lasioglossum leucozonium* flight records.

Heights, Lac Brule, Montreal, Mont Tremblont.

UNITED STATES. CONNECTICUT: *Fairfield Co.:* New Canaan; *Hartford Co.:* Chimunac Area Children's Museum (W of Hartford); *Middlesex Co.:* Killingworth (0.8 mi SE Kroopa Pond); *New Haven Co.:* New Haven. MAINE: *Franklin Co.:* Dryden; *Hancock Co.:* Mt. Desert Island; *Lincoln Co.:* unspecified locality; *Penobscot Co.:* Old Town, Orono; *Somerset Co.:* Skowhegan; *Washington Co.:* Perry, Moosehead Wildlife Preserve (SE of Calais). MASSACHUSETTS: *Bristol Co.:* Westport; *Middlesex Co.:* Bedford, Belmont, Waltham; *Nantucket Co.:* Nantucket Island. MICHIGAN: *Alger Co.:* unspecified locality; *Barry Co.:* Yankee Spring Recreation Area; *Berrien Co.:* Pipestone Twp.; *Chippewa Co.:* Sault Ste. Marie, 14 mi S; *Clare Co.:* Harrison, *Ingham Co.:* East Lansing; *Kalamazoo Co.:* Gull Lake Biological Station; *Kalkaska Co.:* unspecified locality; *Luce Co.:* Pike Lake, 1 mi N; *Mackinac Co.:* Cedarville; *Marquette Co.:* Cranberry Bog, Ives Lake, near Lake Superior, VanRiper State Park; *Ontonogan Co.:* Silver City, 3 mi W; *Oscoda Co.:* Luzerne; *Presque Isle Co.:* Ocqueoc Lake; *Van Buren Co.:* Van Buren State Park; *Wexford Co.:* unspecified locality. NEW HAMPSHIRE: *Belknap Co.:* Meredith; *Coos Co.; Grafton Co.:* Dixville Notch (White Mts.), Franconia, Littleton. NEW JERSEY: *Bergen Co.;* Closter, Tenefly; *Middlesex Co.:* Oldbridge.

NEW YORK: *Albany Co.:* Colonie, Westerlo, 2 mi NW; *Broome Co.:* unspecified locality; *Cayuga Co.:* Fair Haven Beach State Park, Spring Lake; *Franklin Co.:* Tupper Lake; *Jefferson Co.* Westcott Beach State Park; *Hamilton Co.:* Indian Lake, 6 mi E; *Monroe Co.:* unspecified locality; *Nassau Co.:* Bethpage State Park, Hempstead Lake State Park; *Niagara Co.:* Barker, Ft. Niagara State Park; *Orange Co.:* Nyack, Tuxedo, 5 mi NW; *Oswego Co.:* Selkirk Shores State Park; *Otsego Co.:* unspecified locality; *Rensselaer Co.:* Brainard; *Rockland Co.:* Spring Valley; *Saratoga Co.:* unspecified locality; *Schoharie Co.:* Cobleskill; *Suffolk Co.:* Caumsett State Park, Huntington; *Tompkins Co.: Ulster Co.:* Cherrytown. OHIO: *Ashtabula Co.:* Crooked Creek Farm (near Hartsgrove). RHODE ISLAND: *Newport Co.:* Block Island. TENNESSEE: *Blount Co.:* Maryville, 6.7 mi ENE. VERMONT: *Addison Co.:* unspecified locality; *Essex Co.;* unspecified locality; *Windsor Co.:* unspecified locality. VIRGINIA: *Page Co.:* Massanutten Mt. WEST VIRGINIA: *Hardy Co.:* Lost River State Park. WISCONSIN: *Bayfield Co.:* Ino, 5.5 mi W; *Door Co.:* N of Baileys Harbor; *Oneida Co.:* Minocqua, 6 mi SW; *Vilas Co.:* Lac du Flambeau.

27. *Lasioglossum manitouellum* (Cockerell)

FIGURES 39, 504–518

Halictus manitouellus Cockerell, 1908:119 [female].

Halictus manitonellus.—Cockerell, 1910a:260 [lapsus calami].

Lasioglossum manitouellum.—Michener, 1951:1106 [Nearctic catalog].—Hurd, 1979:1957 [Nearctic catalog].—Evans, 1982:573 [predator, *Philanthus barbatus* Smith].

TYPE MATERIAL.—Cockerell described *Lasioglossum manitouellum* from a syntype series of four females. Only two of these specimens could be located, and the one labeled "TYPE" by Cockerell is herein designated the lectotype. This specimen, in the University of Colorado Collection at Boulder, is labeled

T.D.A. & W.P. Cockerell./Manitou ([El Paso County], Col.[orado], Apr. 29 [19]04 [handwritten] TYPE [handwritten by Cockerell with red ink lines bordering lateral edges of label]/LECTOTYPE Halictus manitouellus Cockerell des.[ignated by] McGinley [handwritten on red label].

The lectotype is missing the last two tarsomeres of the middle left leg but otherwise is in excellent condition. The one known paralectotype is in the National Museum of Natural History, Smithsonian Institution.

Distribution (Figure 504).—The latest Nearctic Hymenoptera catalog (Hurd, 1979) reports *Lasioglossum manitouellum* only from Colorado. This species is now known to occur in Arizona, Colorado, Kansas, New Mexico, Texas, and south into Chihuahua, Mexico. Two anomalous females from Hidalgo and Chiapas, Mexico, are herein only tentatively associated with *L. manitouellum*.

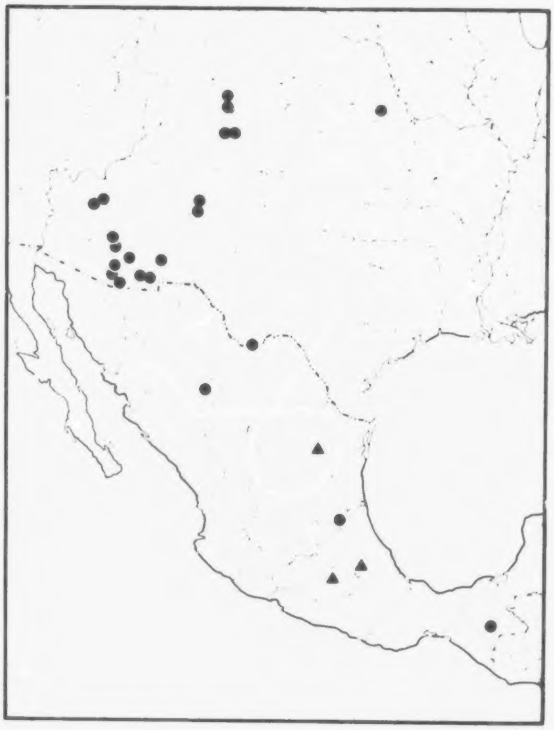


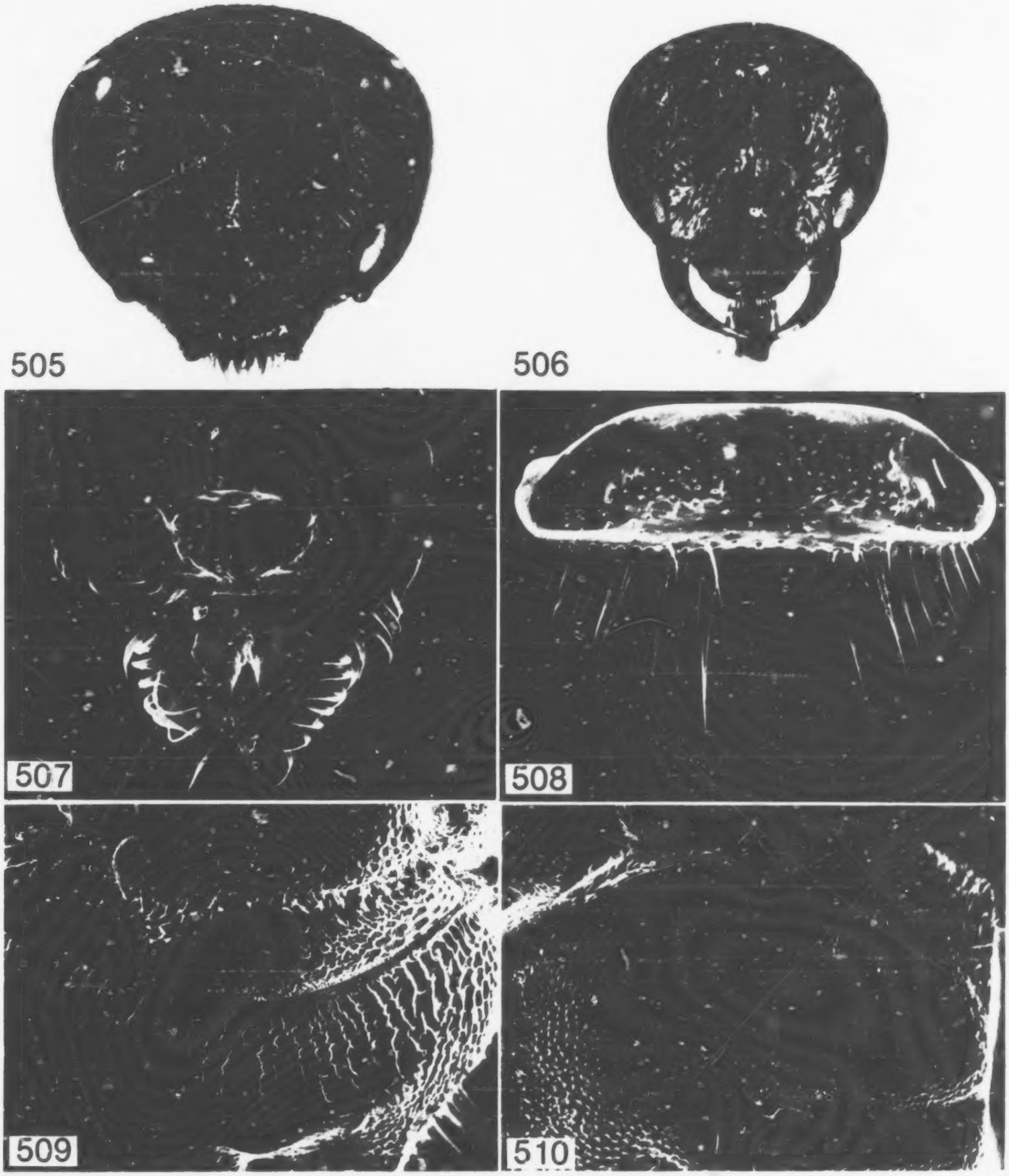
Figure 504.—Distribution of *Lasioglossum manitouellum* (circle) and *L. xyriotropis* (triangle).

Diagnosis.—Females of *Lasioglossum manitouellum* can be recognized by the combination of their entirely granuloso-punctate mesoscuta (Figure 510), moderately short heads (Figure 505), lack of acarinaria, and hyaline forewings with infuscated apices (Figure 229). The entirely granuloso-punctate mesoscutum is characteristic of many Mexican *Lasioglossum* species but is found in only three species occurring in the United States: *L. manitouellum*, *L. acarophilum*, and *L. jubatum*. The latter two species differ from *L. manitouellum* in having large acarinaria on the anterior surface of tergum I (Figures 247, 478). *Lasioglossum heterorhinum*, *L. lampronotum*, and *L. desertum* have the anterior mesoscutal surface granuloso-punctate but the punctures are distinctly separated posteriorly. Among Mexican species, *L. xyriotropis* is most similar to *L. manitouellum* but differs by having a complete pronotal lateral carina (Figure 732; narrowly but distinctly interrupted in *L. manitouellum*). *Lasioglossum transvorsum* and *L. asaphes* are superficially similar to *L. manitouellum* but have longer heads (Figures 275, 646) and differ in other details listed in the diagnosis for both species.

Lasioglossum manitouellum males are best diagnosed by the combination of their short heads (Figure 506), hyaline forewings with infuscated apices, and the elongate, lateral hair fringes on the posterior edge of sternum V (Figure 511). The vestiture of sternum V is very similar to that of *Lasioglossum heterorhinum* and *L. lampronotum* males (Figure 464). However, the latter species do not have infuscated forewing apices and have conspicuously complete pronotal lateral carinae (distinctly interrupted in *L. manitouellum* males).

Description.—female: (1) Length 8.3–10.6 mm ($\bar{x}$ = 9.5, n = 15); (2) wing length 2.7–3.1 mm ($\bar{x}$ = 2.9, n = 15); (3) abdominal width 2.5–3.1 mm ($\bar{x}$ = 2.9, n = 15).

Structure: (4) Head moderately short (Figure 505; length/width ratio 0.85–0.96, $\bar{x}$ = 0.91, n = 15). (7) Supraclypeal area evenly rounded, (8) moderately protuberant. (9) Clypeus projecting approximately 0.69 of its length below lower margin of eyes; (11) surface with narrow median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FIGURES 505–510.—*Lasioglossum manitouellum:* 505, female head; 506, male head; 507, female labrum; 508, male labrum; 509, female propodeum; 510, female mesoscutum.

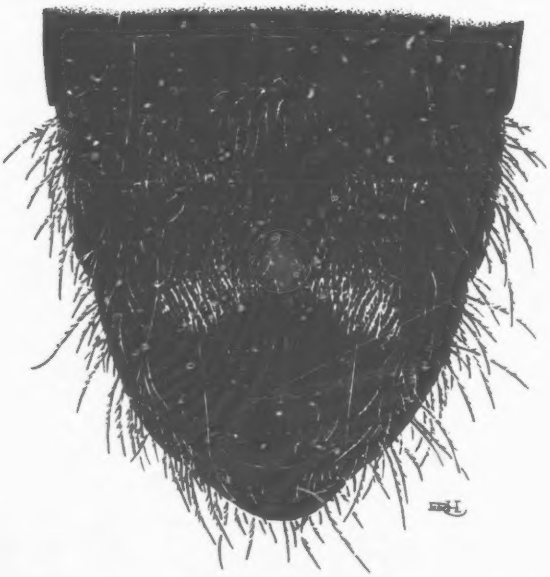


FIGURE 511.—*Lasioglossum manitouellum*, male sternal vestiture.

longitudinal sulcation. (14) Distance between lateral ocelli subequal to distance between lateral ocellus and eye. (23) Flagellomere 1 shorter than 2 along dorsal surface. Labrum as in Figure 507; (27) distal keel moderately broad in frontal view, lateral edges bowed; (28) distal lateral projections moderately well developed, triangular; (29) fimbrial setae acutely pointed.

(32) Pronotal lateral angle broadly obtuse; (33) pronotal lateral ridge incomplete, interrupted by oblique lateral sulcus; (34) lower portion of lateral ridge narrowly rounded. (35) Mesoscutal lip weakly bilobed, (36) moderately elevated from pronotum. (40) Dorsal surface of propodeum about 0.74 the length of scutellum and about 1.2 times the length of metanotum, (41) slightly depressed centrally, (42) posterior margin broadly rounded; (43) propodeal triangle weakly defined, evident medially as an inconspicious V-shaped elevation, lateral rims absent; (44) lateral carinae extending at most to midpoint of posterior surface. (45) Tibial spur as in Figure 39.

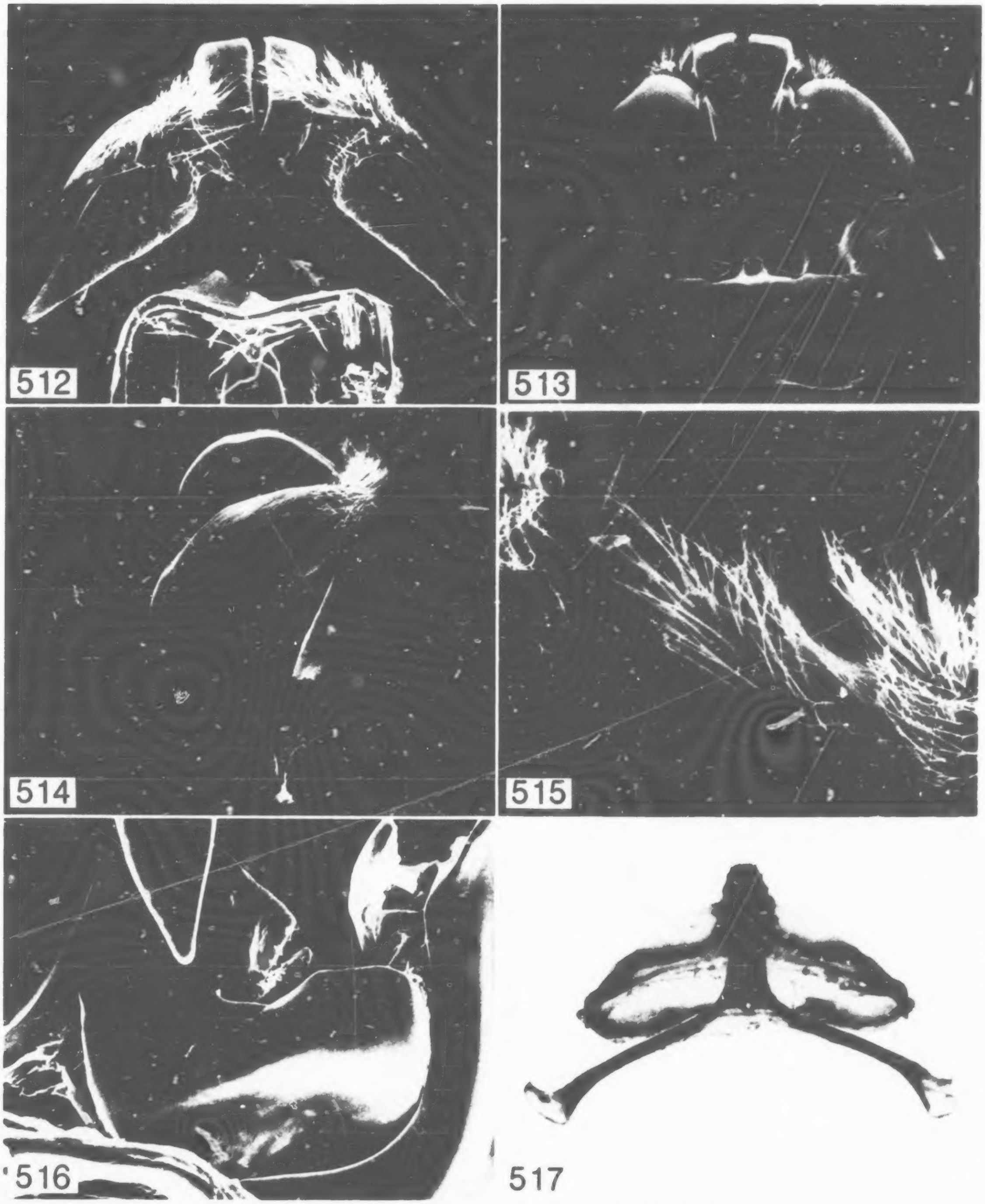
(46) Lateral edge of metasomal tergum II weakly sinuate, nearly straight.

Sculpture: (47) Face shiny, (48) densely punctate below ocelli, punctures contiguous, only slightly less dense near antennae. (51) Supraclypeal area extremely granulate; (52) punctures separated by their width laterally, becoming less dense centrally. (53) Clypeus granulate basally, apical two-thirds polished; (54) punctation sparse, punctures separated by their width basally, becoming obscure apically, apicolateral areas impunctate. (56) Mesoscutum mostly moderately shiny, dull on median anterior portion; (57) punctation as in Figure 510, granuloso-punctate, less dense posteriorly. (58) Scutellum nearly uniformly punctate, punctures less dense than those of mesoscutum, punctures separated by their width or slightly less. (63) Dorsal surface of propodeum (Figure 509) irregularly striate laterally, becoming ruguloso-striolate medially, striae and rugulae reaching posterior margin or nearly so; (64) surface shiny, mostly smooth, alveolate only along extreme basal edge. (65) Metasomal tergum I moderately shiny; (66) punctation fine, extremely dense, punctures nearly contiguous.

Coloration: (71) Wing membrane mostly hyaline with conspicuous infuscated apex beyond marginal cell.

Vestiture: (74) Pubescence of head white. (75) Pubescence of thorax mostly white, pale yellowish brown on scutellum; (76) mesoscutal hairs sparse, inconspicuous, obscurely plumose. (77) Hind tibial hair color differentiated, most hairs white, dorsal hairs dark brown basally, becoming white at tibial midpoint. (78) Anterior hairs of metasomal tergum I white; (79) basal hair bands of terga II–IV yellowish white. (80) Acarinarium absent, elongate hairs scattered over anterior surface of tergum I.

MALE: Similar to female except as follows: (1) length 6.9–8.2 mm ($\bar{x} = 7.5$, $n = 10$); (2) wing length 2.3–2.7 mm ($\bar{x} = 2.5$, $n = 10$); (3) abdominal width 1.9–2.1 mm ($\bar{x} = 2.0$, $n = 10$). (4) Head as in Figure 506 (length/width ratio 0.87–0.96, $\bar{x} = 0.91$, $n = 10$). (5) Gena slightly wider than eye, (6) strongly produced posteriorly. (10) Clypeal surface flat. Labrum as in Figure 508;



FIGURES 512–517.—*Lasioglossum manitouellum,* male; 512, genitalia, ventral view; 513, same, dorsal view; 514, same, lateral view; 515, gonostylus; 516, volsella; 517, sterna VII–VIII.

(24) distal process absent; (25) basal area depressed medially; (26) basal lateral depressions conspicuously developed. (30) Mandible short, just reaching opposing clypeal angle. (53) Clypeus granulate along basal edge, apical two-thirds polished; (54) punctures well formed and dense basally, very fine and scattered over apical two-thirds. (68) Clypeal maculation present. (69) Flagellum entirely dark. (72) Tarsi dark, concolorous with tibiae.

Vestiture: Sternal vestiture as in Figure 511; (82) hairs on sternum IV erect, moderately elongate, without noticeable pattern; (83) sternum V with median rosette of short erect hairs, posterior sternal edge with moderately elongate, widely separated lateral hair lobes.

Terminalia: Sterna VII–VIII as in Figure 517; (85) sternum VIII with short, narrowly rounded median process. Genitalia as in Figures 512–516; (86) gonobase moderately elongate; (87) gonostylus slender, moderately elongate, apex narrowly rounded; (89) retrorse membranous lobe broad; (90) volsella with broadly rounded lateral lobe.

FLIGHT RECORDS (Figure 518).—*Lasioglossum manitouellum* females have been collected in every month from February to December, with peaks in later March and again in early October. The early records are two females, Cochise Co., Arizona, 19 Feb 1963; one female, Pima Co., Arizona, 22 Feb 1956. The late records are two females, 1–10 Nov 1965, Cochise Co.; one female, 11 Nov 1953, Pima Co.; one female, 10 Dec 1967, Cochise Co. Males have been collected in May, July through October, and in December. The one May record was from Nuevo Leon (near Monterrey), Mexico. The two December records were from Cochise Co., Arizona.

FLOWER RECORDS.—Females (71): Compositae 31%; Rosaceae 22%; Ericaceae 18%; Anacardiaceae 13%. Total: 71 in 12 families, 13 genera as follows:

Arctostaphylos 12♀; *Ceanothus* 3♀; *Cimicifuga* *1(1)♀ (collecting pollen, 0. Pellmyr, pers. comm.); *Geranium* 1♀; *Melilotus* 1♀; *Nolina* 1♀; **Penstemon* 1(1)♀ (tentatively associated female from Hidalgo); *Prunus* 15♀; *Rhus* 9♀; *Salix* 3♀; *Solanum* 3♀; *Solidago* 3♀; *Viguiera* 18♀.

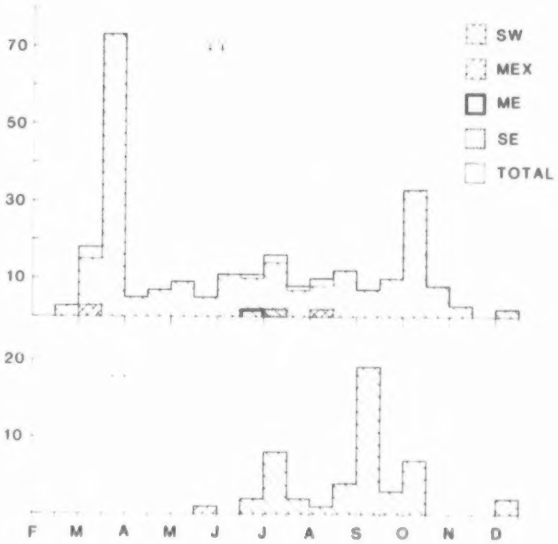


FIGURE 518.—*Lasioglossum manitouellum* flight records.

SPECIMENS EXAMINED.—299 (248♀, 51♂).

MEXICO. CHIAPAS: San Cristobal de las Casas, 2 Aug 1956, J.W. MacSwain, D.D. Linsdale, (1♀; UCB). CHIHUAHUA: Santa Barbara-Ojito, 14 Mar 1948, G.M. Bradt (3♀; AMNH). HIDALGO: Baranca de San Vicente (Laredo Highway), 9 Aug 1957, R.M. Straw, D.P. Gregory (1♀; OrS). NUEVO LEON: Mesa de Chipinque (near Monterrey), 29–30 May 1977, C. Porter, A. Cerbone (1♂; KU).

UNITED STATES. ARIZONA: *Cochise Co.; Coconino Co.:* Oak Greek Canyon (6.5 mi N Sedona); *Gila Co.*: Globe, Parker Greek (Sierra Ancha), Sierra Ancha Experiment Station; *Graham Co.*: Graham Mountains, *Pima Co.*; Santa Cruz Co.: Patagonia, 8 mi S (Hidden Springs Valley); *Yavapai Co.*: Jerome, 4 mi S.

COLORADO: *Boulder Co.*: Boulder; *El Paso Co.*: Colorado Springs, Manitou; *Larimer Co.*: Fort Collins (14–16 mi W), Hewlett Gulch, Loveland (10–13 mi WSW); *Teller Co.*: Green Mountain Falls. KANSAS: *Marshall Co.*: unspecified locality. NEW MEXICO: *Bernalillo Co.*: Albuquerque; *Catron Co.*: Mogollon Mountains; *Grant Co.*: McMillan Camp (13 mi N Silver City), Pinos Altos Mountains; *Hidalgo Co.*: near Rodeo; *Sandoval Co.*: Jemez Springs. TEXAS: *Brewster Co.*: Big Bend National Park (Basin, south rim).

28. *Lasioglossum morrilli* (Cockerell)

FIGURES 41, 519–530

Halictus morrilli Cockerell, 1918a:178 [female].

Lasioglossum morrilli.—Michener, 1954:40 [taxonomic notes: *Lasioglossum morrilli* was not recorded in the 1951 and 1979 Nearctic catalogs].

TYPE MATERIAL.—The female holotype, in the National Museum of Natural History, Smithsonian Institution, is in good condition but is glued by its venter on top of a paper point. Darkened glue (shellac?) obscures much of the venter and right hind leg and also adheres to portions of both pairs of wings. The last two tarsomeres of the left hind leg are missing. The holotype is labeled

Tlahualico Durango Mex.[ico] 3 [Mar] 9 [19]'04/at peach blossums/A W Morrill Collector/Type No. 23214 U.S.N.M. [red label]/Halictus morrilli Ckll. [Cockerell] TYPE [handwritten by Cockerell].

There are no paratypes, because Cockerell described this species from the unique female known to him.

DISTRIBUTION (Figure 519).—*Lasioglossum morrilli* is presently known from only 71 specimens (61♀, 10♂) that have been collected in southern Arizona, New Mexico, Texas, and northern Mexico (Chihuahua, Durango, Nuevo Leon). Most specimens are from Texas.

DIAGNOSIS.—*Lasioglossum morrilli* has the following unique character combination: acarinarium present on anterior surface of metasomal tergum I (Figure 525) with dorsal acarinarial opening narrower than width of lateral hair fringe as seen in dorsal view; head elongate (Figure 520, length/width ratio 0.86–0.96, x̄ = 0.90); wing membrane hyaline; clypeus and supraclypeal area conspicuously polished, not at all granulate.

Lasioglossum bardum, *L. desertum*, and *L. jubatum* are superficially similar to and are sympatric or nearly sympatric with *L. morrilli* but differ in having short heads (Figures 303, 381, 473) and granulate clypeal and supraclypeal surfaces. Furthermore, *L. desertum* and *L. jubatum* have very wide dorsal acarinarial openings (Figures 393, 478).

Among species having acarinaria and elongate heads, *L. paraforbesii* occurs south only to Colorado and Kansas but is also easily distinguished by its pale yellowish brown wing membranes. *Lasioglossum acarophilum* has a distinctive granuloso-punctate mesoscutum (Figure 251; compare with Figure 524) and a wide dorsal acari-

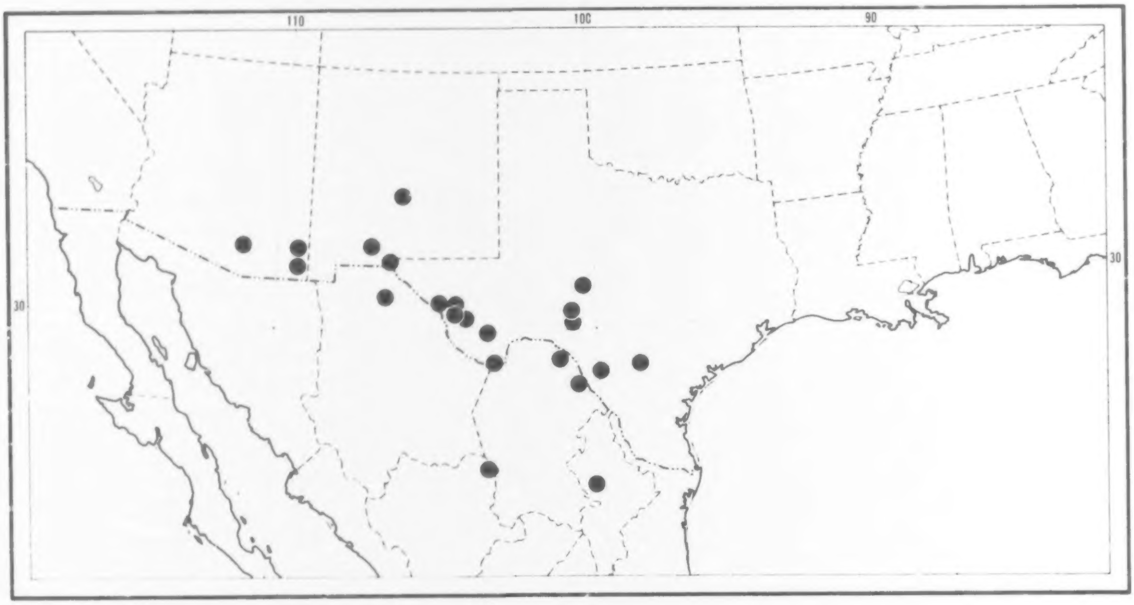


FIGURE 519.—Distribution of *Lasioglossum morrilli*.

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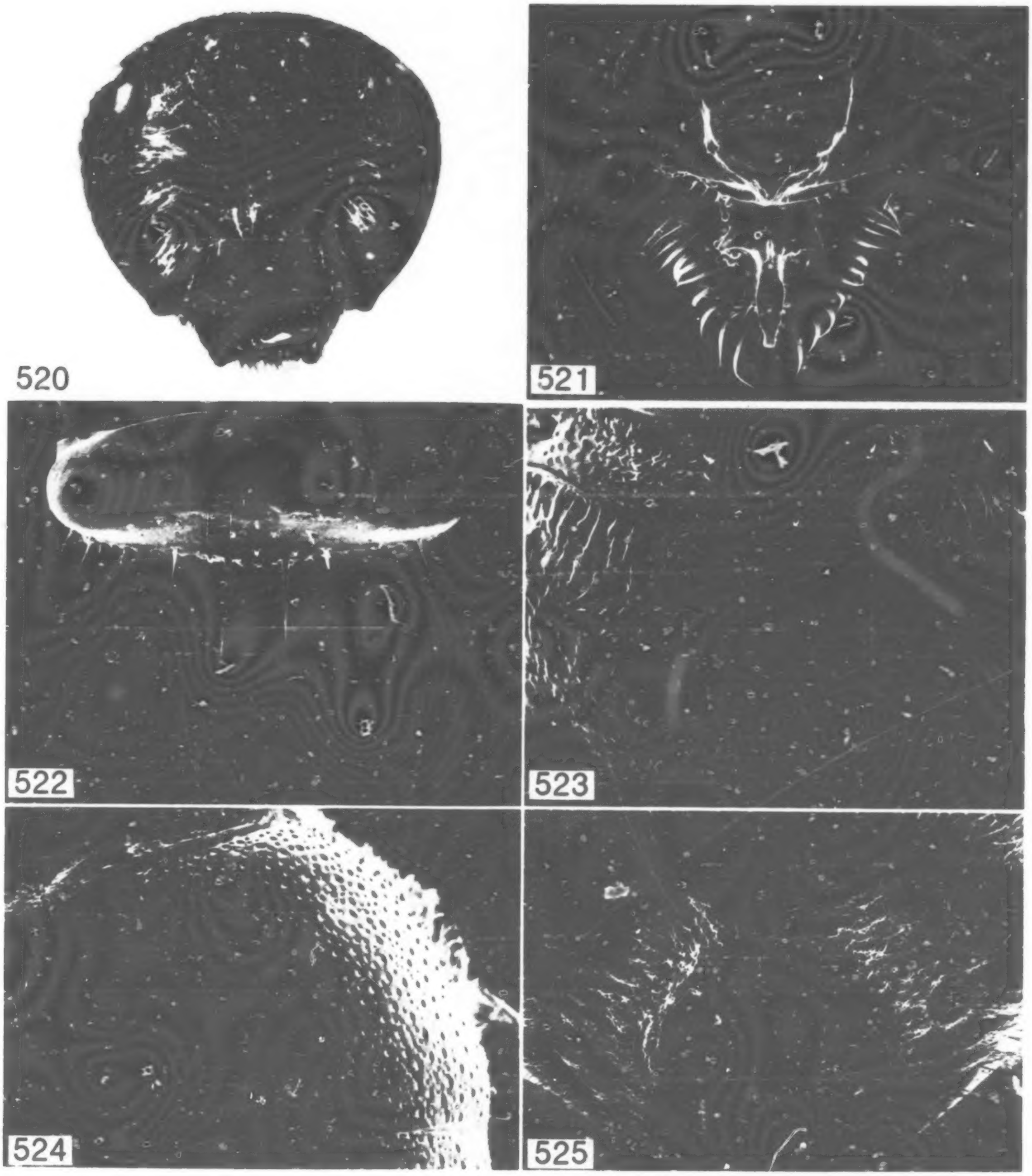
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FIGURES 520–525.—*Lasioglossum morrilli:* 520, female head; 521, female labrum; 522, male labrum; 523, female propodeum; 524, female mesoscutum; 525, female acarinarium at base of tergum I.

narial opening (Figure 247). *Lasioglossum egregium* and *L. trizonatum* are very similar to *L. morrilli* but can be differentiated by the shape of the lateral edge of metasomal tergum II: virtually straight in *L. egregium* (Figure 63), sinuate in *L. morilli* (similar to Figure 61), conspicuously sinuate in *L. trizonatum* (as in Figure 64). The acarinaria of *L. egregium* and L. *trizonatum* are less sharply delimited than that of *L. morrilli* and have wider dorsal acarinarial openings (Figures 693, 711). The former two species also usually have lightly pigmented wing membranes (always hyaline in *L. morrilli*) and granulate clypeal and supraclypeal surfaces.

The elongate head, rounded and virtually impunctate clypeus, and lack of elongate hairs on sternum V will distinguish the male of *L. morrilli* from those of other New World *Lasioglossum*. In its range, the male of *L. morrilli* is most similar to that of *L. manitouellum;* however, the males of the latter species have a flat clypeus, infuscated forewing tips (hyaline in *L. morrilli*) and elongate lateral hair fringes on sternum V.

DESCRIPTION.—FEMALE: (1) Length 8.3–9.7 mm ($\bar{x}$ = 9.2, n = 15); (2) wing length 2.5–2.8 mm ($\bar{x}$ = 2.7, n = 15); (3) abdominal width 2.6–3.0 mm ($\bar{x}$ = 2.8, n = 15).

Structure: (4) Head elongate (Figure 520; length/width ratio 0.86–0.96, $\bar{x}$ = 0.90, n = 15). (7) Supraclypeal area evenly rounded, (8) moderately protuberant. (9) Clypeus projecting approximately 0.91 of its length below lower margin of eyes; (11) surface without median longitudinal sulcation. (14) Distance between lateral ocelli exceeding distance between lateral ocellus and eye. (23) Flagellomere 1 subequal in length to 2 along dorsal surface. Labrum as in Figure 521; (27) distal keel moderately broad in frontal view, lateral edges bowed, with conspicuous basal median groove; (28) distal lateral projections moderately well developed, triangular; (29) fimbrial setae acutely pointed.

(32) Pronotal lateral angle narrowly obtuse; (33) pronotal lateral ridge incomplete, interrupted by oblique lateral sulcus; (34) lower portion of lateral ridge broadly rounded. (35) Mesoscutal lip very weakly bilobed, (36) moderately elevated from pronotum. (40) Dorsal surface of propodeum about 0.75 the length of scutellum and about 1.4 times the length of metanotum, (41) slightly depressed centrally, (42) posterior margin broadly rounded; (43) propodeal triangle weakly defined, evident medially as a low V-shaped elevation, lateral rims inconspicuous; (44) lateral carinae extending at most to midpoint of posterior surface. (45) Tibial spur as in Figure 41.

(46) Lateral edge of metasomal tergum II moderately sinuate.

Sculpture: (47) Face shiny, (48) densely punctate below ocelli, punctures contiguous, becoming larger and less dense near antennae. (51) Supraclypeal area highly polished; (52) punctures separated by their width laterally, impunctate centrally. (53) Clypeus highly polished; (54) punctures separated by less than width basally, apical edge and apicolateral areas impunctate or nearly so. (56) Mesoscutum shiny; (57) punctation as in Figure 524, punctures separated by 1.5 times their width or less laterally, becoming very sparse centrally, punctures 2–5 times their width apart. (58) Scutellum sparsely and finely punctate adjacent to median line, punctures separated by 1–3 times their width. (63) Dorsal surface of propodeum (Figure 523) ruguloso-striolate, often becoming rugulose medially, striae and rugulae reaching posterior margin; (64) surface alveolated. (65) Metasomal tergum I moderately shiny; (66) punctation fine, dense punctures slightly less than their width apart.

Coloration: (71) Wing membrane hyaline.

Vestiture: (74) Pubescence of head white. (75) Pubescence of thorax white; (76) mesoscutal hairs moderately dense and plumose. (77) Hind tibial hairs concolorous, all white, or with light brown dorsal hairs at base. (78) Anterior hairs of metasomal tergum I and (79) basal hair bands of terga II–IV white. (80) Acarinarium present (Figure 525), a moderately large, circular, glabrous area surrounded laterally and dorsally by dense fringe of elongate hairs, dorsal opening of acarinarium narrow, width of opening approximately one-half the width of lateral hair fringe as seen in dorsal view; each side of tergum I with small bald spot posteriad of lateral acarinarial hair fringe.

MALE: Similar to female except as follows: (1) length 7.6–9.0 mm (x̄ = 8.2, n = 6); (2) wing length 2.0–2.4 mm (x̄ = 2.2, n = 6); (3) abdominal width 2.1–2.6 mm (x̄ = 2.2, n = 6). (4) Head elongate (length/width ratio 0.91–1.0, x̄ = 0.95, n = 6). (5) Gena slightly wider than eye, (6) moderately produced posteriorly. (10) Clypeal surface noticeably rounded dorsally, contrasting with shallowly depressed ventral area. Labrum as in Figure 522; (24) distal process very weakly developed, rounded; (25) basal area depressed medially; (26) basal lateral depressions absent. (30) Mandible short, just reaching opposing clypeal angle. (53) Clypeus polished; (54) punctures well formed and dense basally, apical two-thirds virtually impunctate, punctures very fine and scattered. (68) Clypeal maculation present. (69) Flagellum entirely dark. (72) Tarsi dark, concolorous with tibiae.

Vestiture: (82) Hairs on sternum IV elongate, erect, without noticeable pattern; (83) sternum V with inconspicuous median rosette of short hairs but otherwise without noticeable hair patterns.

Terminalia: Sterna VII–VIII as in Figure 530; (85) sternum VIII with moderately elongate, parallel-sided median process, rounded apically. Genitalia as in Figures 526–529; (86) gonobase moderately elongate; (87) gonostylus moderately robust, truncated apically; (89) retrorse membranous lobe very slender; (90) volsella with prominent lateral lobe.

FLIGHT RECORDS.—*Lasioglossum morrilli* females have been collected from late February through November, with most records from May. Five of the known males were collected in early August, one in early September (one with no data).

FLOWER RECORDS.—Females (8): Compositae 25%. Males (3): Compositae 100%. Total: 11 in 7 families, 9 genera as follows:

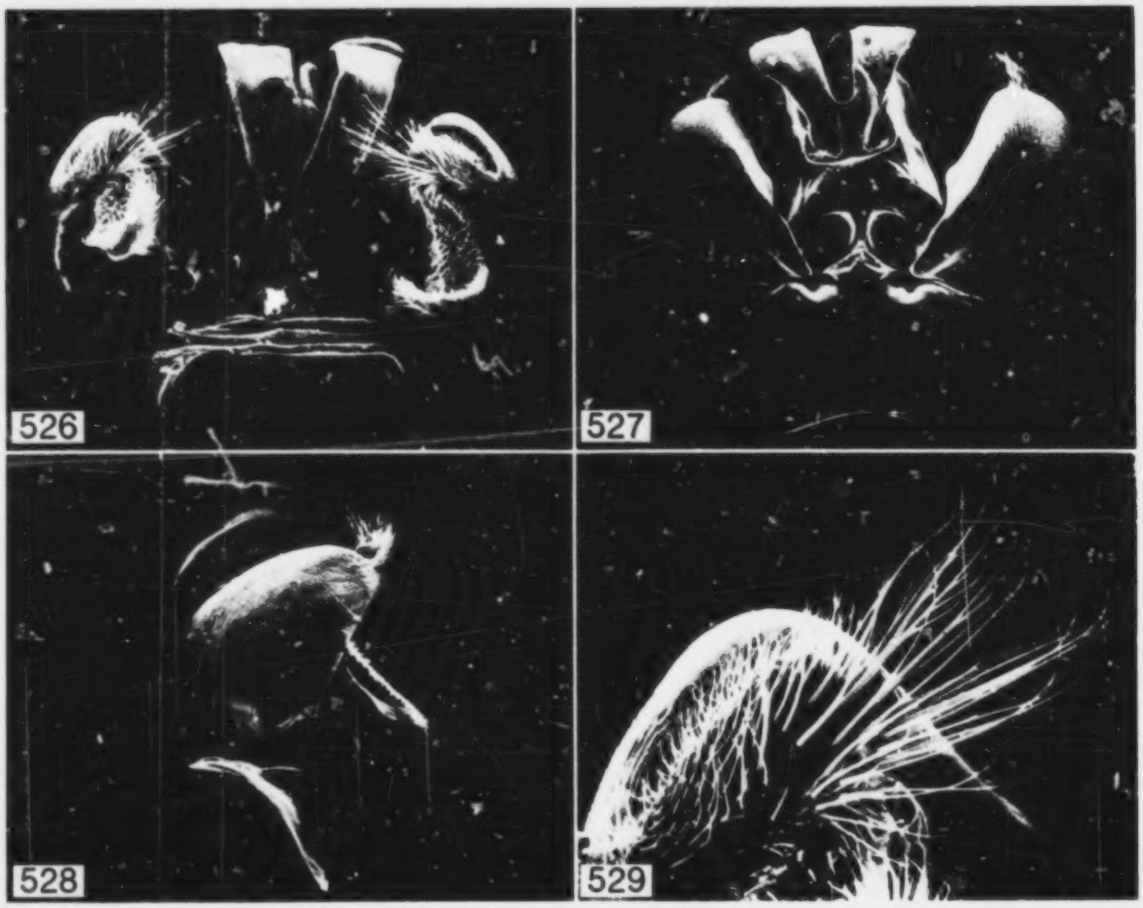
Arctostaphylos 1♀; *Cirsium* 1♀; *Citris* 1♀; *Coreopsis* 1♀; *Dasylirion* 1♀; *Helenium* 3♂; *Lippia* 1♀; *Prunus* 1♀; *Solanum* 1♀.

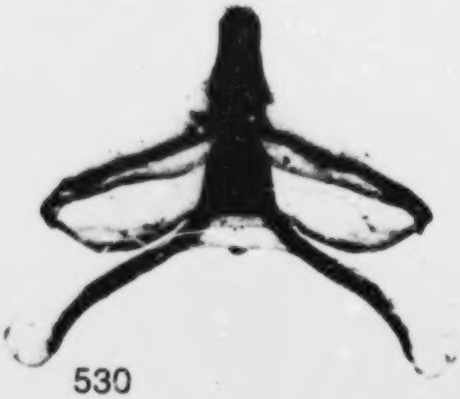
SPECIMENS EXAMINED.—64 (54♀, 10♂).

MEXICO. CHIHUAHUA: Jimenez, 10 mi N, 10 Sept 1950, R.F. Smith (1♂; AMNH); Moctezuma, 2 Nov 1965, G.E. Bohart and A.S. Bohart (1♀; USU); Samalayuca, 24 Jun 1947, Gertsch (1♀; AMNH); Santa Clara, 3 Jul 1946, 6500 ft, Michener (1♀; AMNH). DURANGO: Tlahualilo, 9 Mar 1904, A.W. Morrill (1♀, USNM). NUEVO LEON: Monterrey, 25 Mar 1967, J.A. Francke (1♀; CU).

UNITED STATES. ARIZONA: *Cochise Co.:* Bowie, 8 mi S, 9 Mar 1976, R.A. Belmont (1♂; UCD); Monte Vista Peak, 15 Aug 1978, 9370 ft, R.W. Brooks (2♂; RWB); Rustlers Park, 6 Aug 1958, P.D. Hurd (1♂; UCB), 20 Aug 1973, M. Favreau (1♂; AMNH, 12 Aug 1978, R.W. Brooks (1♂; RWB); Skeleton Canyon, 6 mi SE Apache, 4 Sep 1958, P.D. Hurd (1♀; UCB). *Pima Co.:* Molino Basin, Santa Rita Mts., 21 Feb 1976, F.D. Parker (1♀; USU); Sabino Canyon, Coronado National Forest, 17 Mar 1976, Webb, LaBerge, Marlin, Wolfe, Meyer (2♀; INHS); Santa Catalina Mts, 16 Jul 1973, J.L. Neff (1♀; CU). NEW MEXICO: *Dona Ana Co.:* Las Cruces, 12 Jun 1950, J.G. Rozen (1♀; KU). *Lincoln Co.:* Corona, Gallinas Peak, 12 Aug 1963 (2♂; USU); Carrizozo, 3 mi W, Malpais Lava Bed, 31 Jul 1972, G.C. Eickwort (1♀; CU).

TEXAS: *Bexar Co.:* 12 Jul 1931, G.P. Engelhardt (1♀; AMNH). *Brewster Co.:* Big Bend National Park, 10–12 Jun 1908, Mitchell and Cushman (1♀; USNM), 23 Jun 1947, R.E. Elbel (1♀; KU), 11 Apr 1947, Michener and Beamer (1♀; KU), 14–16 Jul 1950, R.F. Smith (2♀; AMNH), 9 Apr 1965, D. Bolinger (1♀; OrS), 27–28 May 1974, J.R. Powers (4♀; UCB), J. Bequaert (4♀; MCZ, OrS); Marathon, 7 June 1908, Mitchell and Cusiman (1♀; USNM), 2 mi NNW, 24 Jun 1973, M. Masters (1♀; CU). *Culberson Co.:* Van Horn, 14.5 mi S, 6 May 1959, D.P. Gregory (4♀; UCB). *El Paso Co.:* El Paso, 24 mi E, 5 Aug 1976, M. McKinnerney (1♀; CU). *Hudspeth Co.:* 27 Jun, D.J., J.N. Knull (1♀; OhS). *Jeff Davis Co.:* Davis Mts., 19 Jun 1958, D.J. & J.N. Knull (1♀; OhS), 10 Jul 1958, W.F. Barr (4♀; UIM), 1 May 1959, J.M. & S.N. Burns (1♀; UCB); Ft. Davis, 7 mi SE., 22 May 1969, Brothres, Krueger, Michener (1♀; KU); Kent, 10 mi S, 9 Aug 1959, A.S. Menke and L.A. Stange (1♀; UCD); McDonald Observatory, 2 mi N, 31 Jul 1970, J.C. Marlin (1♀; INHS). *Maverick Co.:* Quemado, 28 Mar 1946, C.D. Michener (1♀; AMNH). *Presidio Co.:* Marfa, 24 mi SW, 27 Jun 1968, 5300 ft, J.E. Hafernik (1♂; TAM); Plata, 8 Jun 1968, J.E. Hafernik (1♀; TAM). *Reeves Co.:* Davis Mt. Junction, 31 May 1965, M.E. Irwin (2♀; UCR). *Schleicher Co.:* El Dorado, 10 mi S, 10 Apr 1950, Michener, Rozens, Beamers, Stephen





FIGURES 526–530.—***Lasioglossum morrilli***, male: 526, genitalia, ventral view; 527, same, dorsal view; 528, same, lateral view; 529, gonostylus; 530, sterna VII–VIII.

(1♀; KU). *Sutton Co.:* Sonora, 4 May 1954, R.H. Beamer (1♀; KU). *Tom Green Co.:* San Angelo, 9 Apr 1950, Michener, Rozens, Beamers, Stephen (1♀; KUH). *Uvalde Co.:* Uvalde, Michener, Beamers, Wille, LaBerge (1♀; KU). *Val Verde Co.:* Del Rio, 12 mi NW, 23 May 1969, Brothers, Krueger, Michener (2♀; KU).

Additional Texas records: Bakersfield, 3 May 1954, R.H. Beamer (1♀; KU); Toyahvale, 14 Apr 1954, R.H. & L.D. Beamer (1♀; KU); (1♂, no further data; USNM).

29. *Lasioglossum olympiae* (Cockerell)

FIGURES 42, 203, 531–544

Halictus olympiae Cockerell, 1898b:51 [female].—Vachal, 1904:476 [male].

Lasioglossum olympiae.—Michener, 1951:1107 [Nearctic catalog].—Moldenke and Neff, 1974:53 [locality and flower records, sex ratio].—Hurd, 1979:1957 [Nearctic catalog].

TYPE MATERIAL.—The female holotype, in the National Museum of Natural History, Smithsonian Institution, is in good condition. It is labeled

Olympia, [Thurston County], Wash.[ington]/6[June]26[18]96/Type No. 29420 U.S.N.M. [red label]/H.[alictus] olympiae n. sp. [handwritten by Cockerell].

There were no paratypes designated.

Halictus olympiae var. *subangustus*, long thought to be a junior synonym of *Lasioglossum olympiae*, is herein reported to be a junior synonym of *L. sisymbrii*.

DISTRIBUTION (Figure 531).—*Lasioglossum olympiae* is presently known from north and central California, Idaho, Oregon, Washington, and Vancouver Island. It does not occur in Colorado as was tentatively reported in both nearctic catalogs.

DIAGNOSIS.—The strong, regular striations of the propodeal dorsal surface (Figure 536) will distinguish *Lasioglossum olympiae* from all other New World *Lasioglossum* except *L. leucozonium*, *L. zonulum*, *L. pacificum*, *L. timberlakei*, and *L. sisymbrii*. *Lasioglossum leucozonium* and *L. zonulum* have relatively longer heads than that of *L. olympiae* (Figures 492, 532, 734), coarser mesoscutal punctation (Figures 497, 537, 739), and a conspicuously short propodeal dorsal surface that is only slightly longer than the metanotum (Figures 496, 738; noticeably longer than metanotum in *L. olympiae* as in most other species). *Lasioglossum sisymbrii* is easily differentiated from *L. olympiae* by the former species' basal hair band on tergum I (Figure 132) and its pale, translucent tegulae. The most similar species to *L. olympiae* are *L. pacificum* and *L. timberlakei* (especially the dark form). They differ from *L. olympiae* in having the posterior edge of the propodeal dorsal surface slightly bowed posteriad as seen in dorsal view (Figure 559; sharply truncated in *L. olympiae*, Figure 536). Furthermore, *L. pacificum* and *L. timberlakei* (dark form) have the dorsal propodeal striations more widely spaced than those of *L. olympiae* (Figures 536, 559, 623), the area immediately dorsoanteriad of the middle coxa striolated and dull (Figure 147; relatively smooth and polished in *L. olympiae*, Figure 146), and the head and body pubescence generally pale yellowish brown to golden (white in *L. olympiae*).

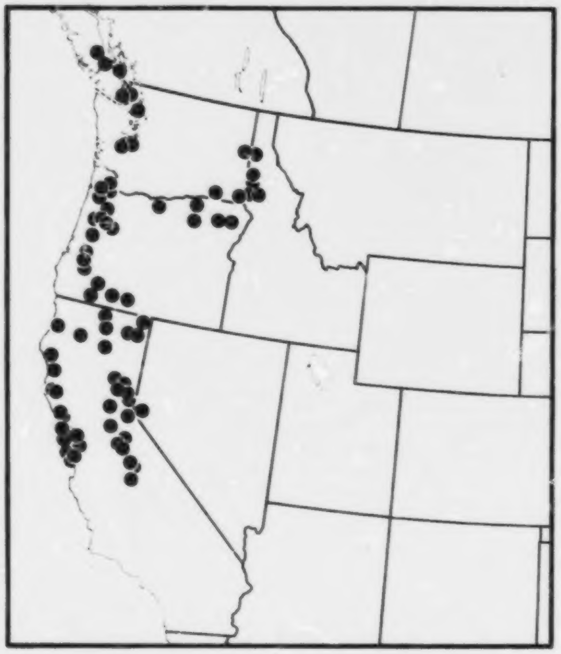
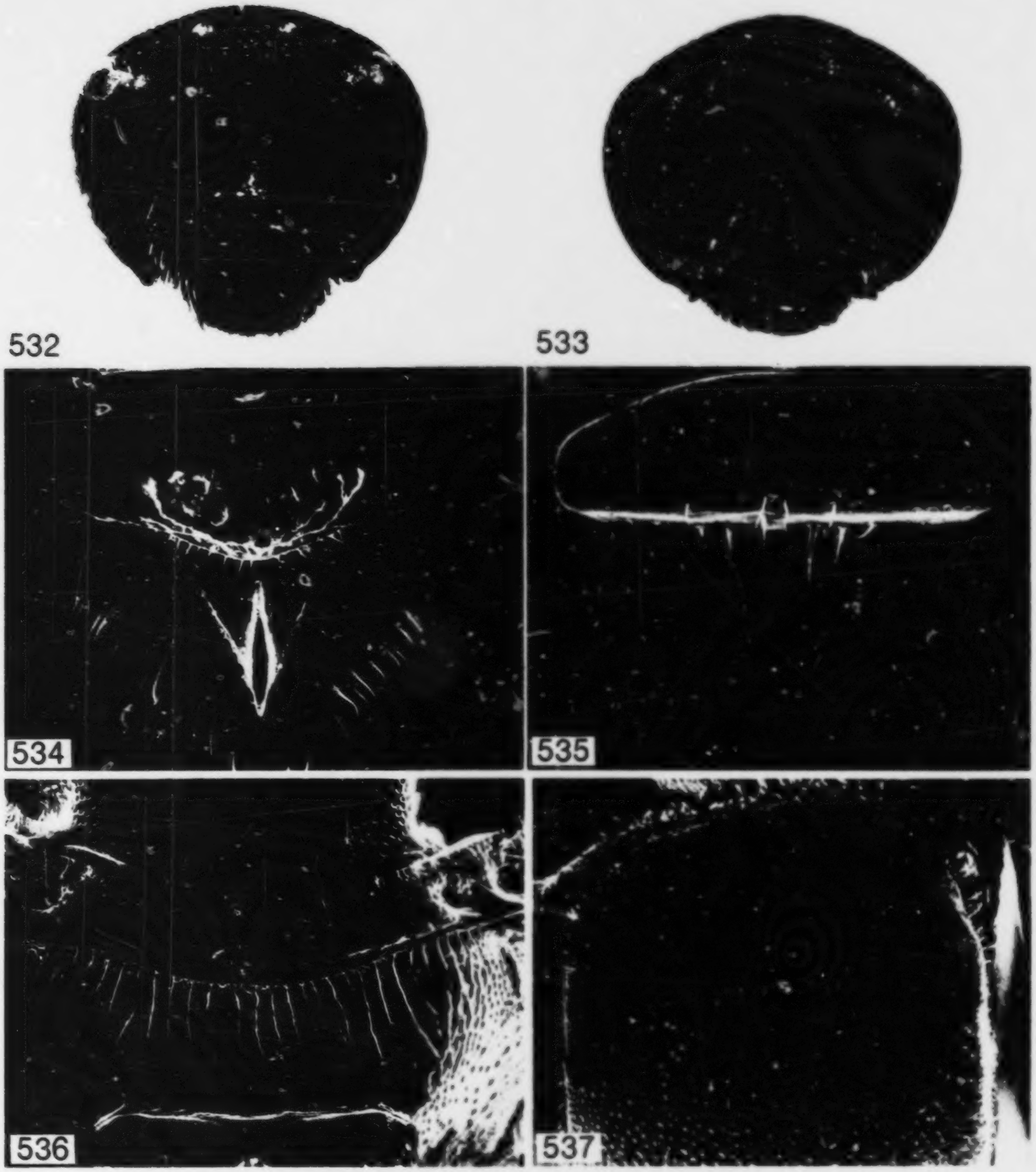


FIGURE 531.—Distribution of *Lasioglossum olympiae*.

Males of *L. olympiae* can be recognized by the unique vestiture of sternum V, characterized by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FIGURES 532–537.—*Lasioglossum olympiae:* 532, female head; 533, male head; 534, female labrum; 535, male labrum; 536, female propodeum; 537, female mesoscutum.

a median, longitudinal patch of short, dense hairs (Figure 203). Also helpful in identifying these males (but not unique) is the strongly striate dorsal propodeal surface and the lack of a clypeal maculation.

DESCRIPTION.—FEMALE: (1) Length 7.6–9.6 mm ($\bar{x}$ = 8.9, n = 15); (2) wing length 2.3–2.8 mm ($\bar{x}$ = 2.6, n = 15); (3) abdominal width 2.7–3.1 mm ($\bar{x}$ = 3.0, n = 15).

Structure: (4) Head short (Figure 532; length/width ratio 0.77–0.88, $\bar{x}$ = 0.83, n = 15). (7) Supraclypeal area evenly rounded, (8) weakly protuberant. (9) Clypeus projecting approximately 0.78 of its length below lower margin of eyes; (11) surface without median longitudinal sulcation. (14) Distance between lateral ocelli subequal to distance between lateral ocellus and eye. (23) Flagellomere 1 subequal in length to 2 along dorsal surface. Labrum as in Figure 534; (27) distal keel narrow in frontal view, lateral edges slightly bowed; (28) distal lateral projections virtually absent, evident as obscure swellings; (29) fimbrial setae acutely pointed (unlike other species, sensillae on basal elevation on conspicuous, wart-like swellings).

(32) Pronotal lateral angle moderately obtuse; (33) pronotal lateral ridge incomplete, broadly interrupted by oblique lateral sulcus; (34) lower portion of lateral ridge inconspicuous, broadly rounded. (35) Mesoscutal lip rounded, not bilobed, (36) moderately elevated from pronotum. (40) Dorsal surface of propodeum about 0.69 the length of scutellum and about 1.2 times the length of metanotum, (41) not depressed centrally, (42) posterior margin sharply truncated; (43) propodeal triangle weakly defined laterally; (44) lateral carinae completely encircling posterior surface. (45) Tibial spur as in Figure 42.

(46) Lateral edge of metasomal tergum II weakly sinuate, nearly straight.

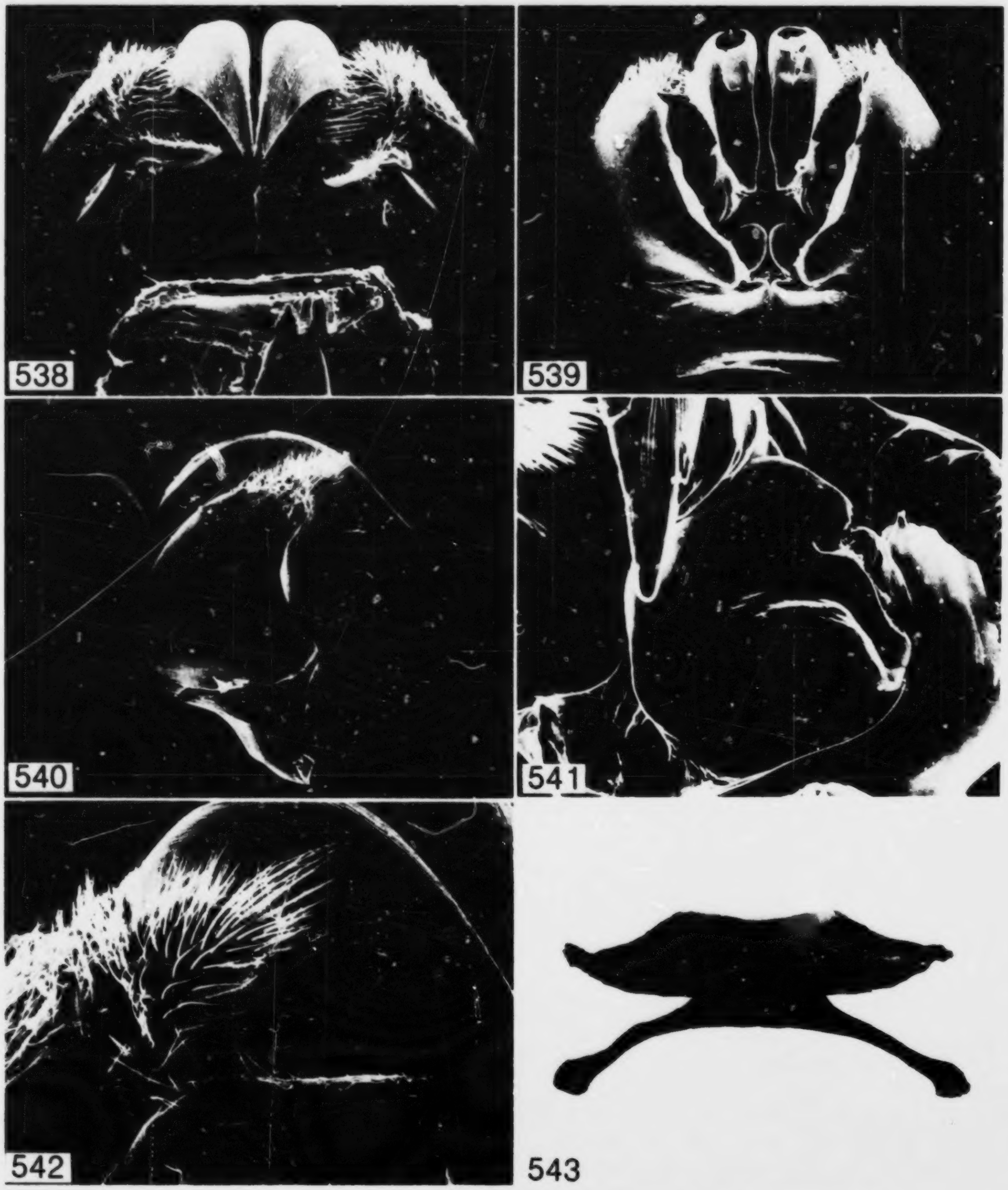
Sculpture: (47) Face shiny, (48) densely and uniformly punctate between ocelli and antennae, punctures contiguous. (51) Supraclypeal area extremely granulate; (52) uniformly and densely punctate, punctures separated by their width or less. (53) Clypeus granulate basally and medially to apex, apicolateral areas polished; (54) punctures separated by less than their width basally, becoming less dense apically. (56) Mesoscutum shiny; (57) punctation as in Figure 537, nearly uniform, punctures 1–2 times their width apart, granuloso-punctate along anterior edge. (58) Scutellum sparsely punctate adjacent to midline, punctures 2–3 times their width apart. (63) Dorsal surface of propodeum (Figure 536) strongly and completely striated, striae closer together medially than laterally, usually with obscure rugulae in median sulcations; (64) surface smooth, not alveolated. (65) Metasomal tergum I shiny; (66) punctation fine, moderately sparse, punctures about 2 times their width apart.

Coloration: (71) Wing membrane nearly hyaline, very lightly pigmented.

Vestiture: (74) Pubescence of head white. (75) Pubescence of thorax white to yellowish white; (76) mesoscutal hairs moderately dense, conspicuously plumose. (77) Hind tibial hair color differentiated, mostly white to pale yellowish brown, dorsal hairs dark brown to brown. (78) Anterior hairs of metasomal tergum I and (79) basal hair bands of terga II–IV white. (80) Acarinarium absent, elongate hairs scattered over anterior surface of tergum I.

MALE: Similar to female except as follows: (1) length 6.2–7.8 mm ($\bar{x}$ = 7.0, n = 15); (2) wing length 1.8–2.3 mm ($\bar{x}$ = 2.0, n = 15); (3) abdominal width 2.0–2.5 mm ($\bar{x}$ = 2.3, n = 15). (4) Head as in Figure 533 (length/width ratio 0.76–0.95, $\bar{x}$ = 0.86, n = 15). (5) Gena subequal to eye in width, (6) rounded, not produced posteriorly. (10) Clypeal surface broadly rounded, not flattened or depressed. Labrum as in Figure 535; (24) distal process absent; (25) basal area rounded medially, not depressed; (26) basal lateral depressions absent. (30) Mandible very short, not reaching opposing clypeal angle. (53) Clypeus weakly granulate, shiny; (54) punctation nearly uniform throughout, punctures separated by 1–2 times their width. (68) Clypeal maculation absent. (69) Flagellum entirely dark. (72) Tarsi dark, concolorous with tibiae.

Vestiture: Sternal vestiture as in Figures 203;



FIGURES 538–543.—*Lasioglossum olympiae*, male: 538, genitalia, ventral view; 539, same, dorsal view; 540, same, lateral view; 541, volsella; 542, gonostylus, 543, sterna VII–VIII.

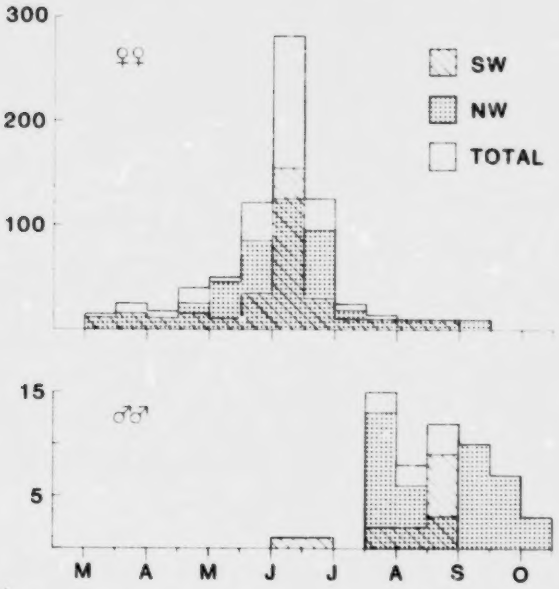


FIGURE 544.—*Lasioglossum olympiae* flight records.

(82) posterior half of sternum IV with dense, conspicuous band of adpressed hairs; (83) sternum V with a unique median, longitudinal patch of short, dense hairs; posterior sternal edge with short lateral hair fringes.

Terminalia: Sterna VII–VIII as in Figure 543; (84) unlike other species, sternum VII relatively large, median process broad; sternum VIII without median process, disc conspicuously broad. Genitalia in Figures 538–542; (86) gonobase short; (87) gonostylus short, broadly rounded; (89) retrorse membranous lobe extremely reduced, slender; (90) volsella with lateral flange but lacking prominent lobe.

FLIGHT RECORDS (Figure 544).—*Lasioglossum olympiae* females have been collected from March through early September, with 78% of the records from May and June, with a peak in early June. The one female collected in September was taken in Benton County, Oregon. The one female record from October was from Santa Clara County, California.

Most male specimens have been collected in late July through August, with records ranging from June to early October. All of the 17 records from September were specimens collected in Oregon and British Columbia. The three males collected in October were from Latah County, Idaho; the two collected in June were from Alameda and Marin counties, California.

FLOWER RECORDS.—The flower records for *L. olympiae* are highly influenced by a large series of females (113 specimens) collected by E.G. Linsley and A.J. Walz in Mariposa County, California, June 1942. All of these females were taken from *Eriogonum* (none had pollen loads).

Summary: Females (204): Polygonaceae 52%; Rosaceae 13%. Males (10): Compositae 100%. Total: 214 in 15 families, 23 genera as follows:

Brassica 2♀; **Ceanothus* 8(2)♀; *Crataegus* 1♀; **Downingia* 2(1)♀; *Eriogonum* 109♀; **Eschscholtzia* 2(1)♀; **Heracleum* 12(1)♀; *Lasthenia* 3♀; *Layia* 1♀; **Limnanthes* 8(1)♀; *Orthocarpus* 2♀; **Phacelia* 2(2)♀; *Potentilla* 4♀; *Ranunculus* 9♀; *Rosa* 8♀; *Rubus* 8♀; *Salix* 4♀; **Sisyrinchium* 1(1)♀; *Solidago* 9♂; *Spiraea* 7♀; *Taraxacum* 1♀; *Trifolium* 7♀; *Veronica* 3♀.

SPECIMENS EXAMINED.—857 (800♀, 57♂).

CANADA. **BRITISH COLUMBIA:** Bowser, Courtenay, Gabriola Island, Langford, Nanaimo Biology Station, Royal Oak, Saanich, Victoria.

UNITED STATES. **CALIFORNIA:** *Alameda Co.:* Albany, Berkeley, Piedmont; *Amador Co.:* Fiddletown, 5.6 mi E; *Contra Costa Co.:* Antioch, Orinda Village; *El Dorado Co.:* Lake Tahoe, Strawberry Valley, Tallac; *Fresno Co.:* Sulphur Meadow, Shaver Lake; *Humboldt Co.:* Bair's Ranch, Fort Seward, Garberville, 3 mi N; *Madera Co.:* Midway, Oakhurst; *Marin Co.; Mariposa Co.:* Fish Camp, Miami Ranger Station, Wawona; *Mendocino Co.; Modoc Co.:* Adin Pass, Buck Creek Ranger Station, Davis Creek, Likely, 15.4 mi E; *Nevada Co.:* Russell Valley, Sagehen, near Hobart Mills, *Placer Co.:* Dutch Flat; *Plumas Co.:* Butterfly Valley, Clio, Quincy (4 mi W), Portola; *San Francisco Co.:* salt marshes, San Francisco Bay; *San Mateo Co.:* King's Mountain, Menlo Park; *Santa Clara Co.:* Los Gatos, Palo Alto; *Santa Cruz Co.:* Felton; *Shasta Co.:* Burney, Hat Creek; *Sierra Co.; Siskiyou Co.:* Bartle (1 mi SE), Dorris (16 mi SW), Fallen Leaf Lake, Lake Tahoe; *Sonoma Co.; Trinity Co.:* Big Flat, Coffee Creek; *Tuolumne Co.* **IDAHO:** *Kootenai Co.:* Coeur d'Alene; *Latah Co.:* Deary, Potlatch, Troy; *Lewis Co.:* Nezperce; *Nez Perce Co.:* Gifford, Lewiston. **NEVADA:** *Douglas Co.:* Carlson Valley.

OREGON: *Benton Co.; Clackamas Co.:* Oswego; *Columbia Co.:* Scappoose; *Douglas Co.; Jackson Co.; Klamath Co.:* Bly Mountain, Klamath Lake; *Lake Co.:* unspecified locality; *Lane Co.:* Eugene; *Lincoln Co.:* Lincoln, 6 mi W; *Linn Co.; Marion Co.:* Mt. Angel, Salem, Wheatland Ferry; *Sherman Co.:* Mosier; *Umatilla Co.:* Echo, Ukiah-Dale Forest wayside, Camas

Creek; *Union Co.:* Cove; *Wallowa Co.:* Minam State Park; *Washington Co.:* Forest Grove; *Yamhill Co.:* Sheridan. WASHINGTON: *Asotin Co.:* Anatone, 1 mi S; *Island Co.:* Oak Harbor, 2 mi NE (Whidby Island); *San Juan Co.:* Friday Harbor, San Juan Island; *Pierce Co.:* Fort Lewis; *Spokane Co.:* Spokane; *Thurston Co.:* Olympia, Tenino; *Walla Walla Co.:* Walla Walla.

30. *Lasioglossum orphnaeum*, new species

FIGURES 13, 300, 545–553

TYPE MATERIAL.—The female holotype is in the Snow Museum, University of Kansas, Lawrence. It is in excellent condition and is labeled

MEXICO Puebla Apulco (N. of Zacapoaxtla) 4700 ft. 19 June 1961 U. Kans. Mex. Exped./HOLOTYPE Lasioglossum orphnaeum R.J. McGinley [red label].

The one male paratype is in the University of Kansas collection and six female paratypes are deposited in the Michigan State University collection in East Lansing (the paratypes are listed in the "Specimens Examined" section).

ETYMOLOGY.—The specific epithet is derived from the Greek *orphnos* (dark, dusky), and alludes to the dark-brown mesoscutal hairs characteristic of this species.

DISTRIBUTION (Figure 300).—*Lasioglossum orphaneum* is presently known from only seven females and one male from the Mexican states of Puebla and Veracruz.

DIAGNOSIS.—Females of *L. orphnaeum* are the only Mexican *Lasioglossum* having a strongly striate dorsal propodeal surface (Figure 547). The propodeum of *L. perscabrum* is highly sculptured but reticulate (Figure 599), not striate. Like *L. perscabrum*, the mesoscutal punctuation is coarse, nearly contiguous and becomes scabrous along the anterior edge (Figure 548) and the pronotal lateral angle is sharply projecting. Unlike *L. perscabrum*, the mesoscutal hairs of *L. orphnaeum* are dark brown (found elsewhere only in *L. eickworti* and *L. katyae*, which differ from *L. orphnaeum* in lacking the strongly sculptured propodeal surface). The pronotal lateral carina appears complete, only obscurely notched by an oblique lateral sulcus (Figure 549).

Lasioglossum citerius, known only from the unique holotype female, which lacks locality data, is probably a Mexican species (see "Distribution" section for *L. citerius*). It shares with *L. orphnaeum* the dark mesoscutal hairs, the striate dorsal propodeal surface, and the sharply projecting pronotal angles. *Lasioglossum citerius* differs from *L. orphnaeum* in having the anterior median edge of the mesoscutum strongly elevated and bilobed (moderately elevated and weakly bilobed in *L. orphnaeum*), having large, widely separated mesoscutal punctures posteriorly (Figure 336; compare with Figure 548), and by having a broadly interrupted pronotal lateral carina with the lower portion of the carina broadly rounded and inconspicuous (similar to that of *L. pacificum*, Figure 12; pronotal carina sharply edged, nearly complete in *L. orphnaeum*, Figure 549).

The propodeal sculpturing of the one known *L. orphnaeum* male is similar to that of the female but has fewer striae. The mesoscutal hairs of the male are not so dark as those of the female, and the pronotal lateral carina is conspicuously complete and sharply edged.

DESCRIPTION.—FEMALE: (1) Length 7.8–9.3 mm ($\bar{x}$ = 8.3, n = 6); (2) wing length 2.3–2.4 mm ($\bar{x}$ = 2.4, n = 6); (3) abdominal width 2.5–2.8 mm ($\bar{x}$ = 2.6, n = 6).

Structure: (4) Head short (Figure 545; length/width ratio 0.83–0.91, $\bar{x}$ = 0.88, n = 6). (7) Supraclypeal area evenly rounded with well-developed frontal carina dorsally, (8) area weakly protuberant. (9) Clypeus projecting approximately 0.68 of its length below lower margin of eyes; (11) surface with obscure median longitudinal sulcation. (14) Distance between lateral ocelli slightly exceeded by distance between lateral ocellus and eye. (23) Flagellomere 1 subequal to 2 in length along dorsal surface. Labrum as in Figure 546; (27) distal keel moderately narrow, lateral edges bowed; (28) distal lateral projections absent; (29) fimbrial setae acutely pointed.

(32) Pronotal lateral angle forming sharply projecting right angle; (33) pronotal lateral ridge

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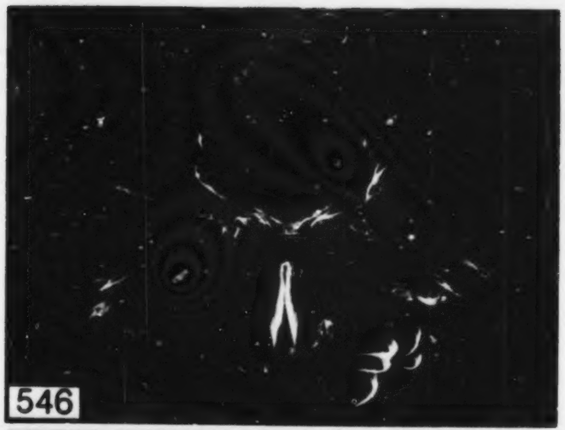

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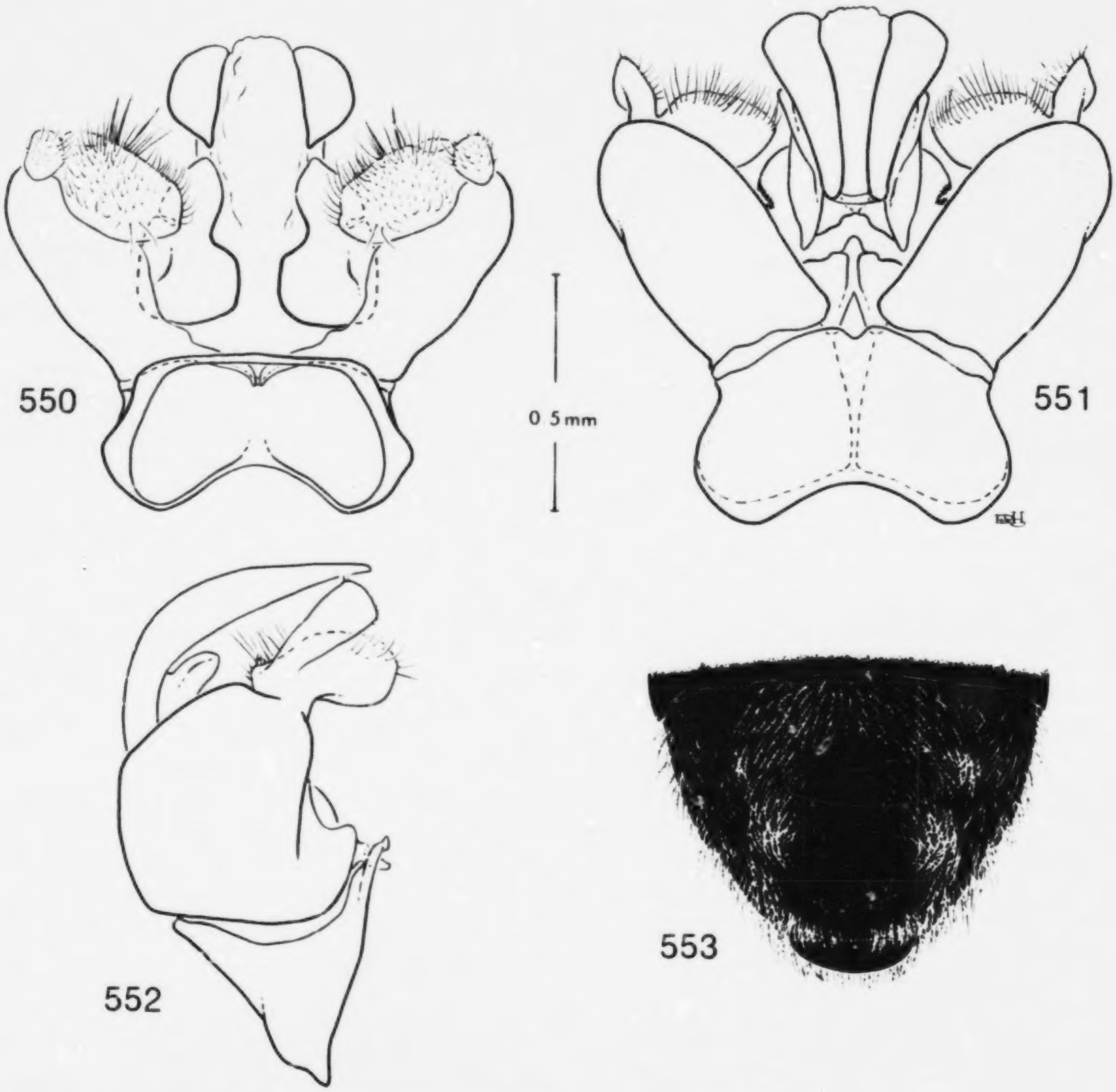
FIGURES 545–549.—*Lasioglossum orphnaeum*, female: 545, head; 546, labrum; 547, propodeum; 548, mesoscutum; 549, pronotum, lateral view.

nearly complete, obscurely notched by oblique lateral sulcus (similar to *L. perscabrum*); (34) lower portion of lateral ridge sharply edged. (35) Mesoscutal lip weakly bilobed, (36) moderately elevated from pronotum. (40) Dorsal surface of propodeum about 0.80 the length of scutellum and about 1.5 times the length of metanotum, (41) depressed centrally, (42) posterior margin



FIGURES 550–553.—*Lasioglossum orphnaeum*, male: 550, genitalia, ventral view, 551; same, dorsal view; 552, same, lateral view; 553, sternal vestiture.

rounded; (43) propodeal triangle defined medially by a low V-shaped elevation, laterally by distinct carinate rims; (44) lateral carinae well developed, extending nearly to dorsal surface. (45) Tibial spur as in Figure 43.

(46) Lateral edge of metasomal tergum II weakly sinuate.

Sculpture: (47) Face shiny, (48) densely and uniformly punctate between ocelli and antennae punctures contiguous. (51) Supraclypeal area obscurely granulate, shiny; (52) punctation sparse. (53) Clypeus granulate basally, apical two-thirds polished; (54) punctures obscure basally, sparse apically, separated by 1–3 times their width. (56) Mesoscutum shiny; (57) punctation as in Figure 548, punctures coarse, contiguous laterally, separated by their width centrally, surface conspicuously scabrous anteriorly. (58) Scutellum with moderately sparse punctation adjacent to median line, punctures 2–3 times their width apart. (63) Dorsal surface of propodeum (Figure 547) strongly striate basally, posterior half rugose, median stria very well developed; (64) surface smooth, not alveolated. (65) Metasomal tergum I moderately shiny; (66) punctation fine, dense, punctures slightly less than their width apart.

Coloration: (71) Wing membrane mostly hyaline, obscurely infuscated apically.

Vestiture: (74) Pubescence of head white on gena and near antennae, becoming brown on vertex. (75) Pubescence of mesoscutum, scutellum dark brown, hairs on metanotum, propodeum and mesopleuron white; (76) mesoscutal hairs moderately dense, conspicuously plumose. (77) Hind tibial hairs concolorous, brown. (78) Anterior hairs of metasomal tergum I and (79) basal hair bands of terga II–IV white. (80) Acarinarium absent, elongate hairs scattered over anterior surface of tergum I. (81) Unlike most species, basal hair bands narrow, covering at most basal 0.25 of terga.

MALE: Similar to female except as follows: (1) length 7.0 mm (n = 1); (2) wing length 2.2 mm (n = 1); (3) abdominal width 2.0 mm (n = 1). (4) Head short, length/width ratio 0.90 (n = 1). (5) Gena subequal to eye in width, (6) moderately produced posteriorly. (10) Clypeal surface noticeably depressed ventrally. (24) Labral distal process weakly developed, broadly rounded; (25) basal area only faintly depressed medially; (26) basal lateral depressions well developed. (30) Mandible moderately elongate, reaching slightly beyond opposing clypeal angle. (53) Clypeus granulate, shiny; (54) punctation nearly uniform throughout, punctures larger and slightly less dense towards apical edge, absent in apical median depression. (68) Clypeal maculation absent. (69) Flagellum entirely dark. (72) Tarsi dark, concolorous with tibiae.

Vestiture: Sternal vestiture as in Figure 553; (82) hairs on sternum IV moderately short, suberect medially, directed laterally and becoming elongate near lateral edge of sternum; (83) vestiture of sternum V similar to that of sternum IV but with lateral elongate hairs noticeably curled.

Terminalia: Sterna VII–VIII were not available for study. Genitalia as in Figures 550–552; (86) gonobase moderately elongate; (87) gonostylus elongate, gradually increasing in width to bluntly rounded apex; (89) retrorse membranous lobe very short, bulbous; (90) volsella with weakly developed lateral lobe.

FLIGHT RECORDS.—Six of the seven known *L. orphnaeum* females were collected in early August. The other female and the one known male were taken in late June.

SPECIMENS EXAMINED.—Holotype and seven paratypes (7♀, 1♂).

MEXICO. PUEBLA: Apulco (N of Zacapoaxtla), 19 Jun 1961, 4700 ft, Univ. Kansas Mex. Exped. (1♀, holotype; KU); Chautapehual (N of Zacapoaxtla), 19 Jun 1961, 5300 ft, Univ. Kansas Mex. Exped. (1♂; KU).

VERACRUZ: Jalapa, 1–6 Aug 1961, R. & K. Dreisbach (6♀; MSU FL).

31. *Lasioglossum pacificum* (Cockerell)

FIGURES 12, 44, 554–568

Halictus pacificus Cockerell, 1898c:50–51 [female, misidentified male, key].—Vachal, 1904:472 [female].—Crawford, 1906:301 [locality record].

Lasioglossum pacificum.—Michener, 1951:1107 [Nearctic catalog].—Linsley and MacSwain, 1959:22 [flight records, association with *Ranunculus*].—Moldenke and Neff, 1974:54 [locality and flower records].—Hurd, 1979:1957 [Nearctic catalog].

TYPE MATERIAL.—In his original description of *Halictus pacificus*, Cockerell did not designate a holotype. The lectotype female, designated herein, is labeled

HOLOTYPE [on red label/Olympia [Thurston County], Wash.[ington]/6 [June] 24 [18]95 [handwritten in pencil]/H.[alictus] pacificus. Ckll. [Cockerell] n. sp. [new species] [handwritten by Cockerell/LECTOTYPE Halictus pacificus Cockerell des.[ignated by] McGinley [on red label].

The specimen, deposited in the California Academy of Sciences in San Francisco, has many body hairs soiled or matted but otherwise is in good condition.

Cockerell mentions that the male of *H. pacificus* has the "apical portion of clypeus yellow" and the "hind tibiae at both ends, and all the tarsi, yellow," which is clearly a misassociation, as both the clypeus and tarsi of *L. pacificum* are never yellow. The male that Cockerell describes is possibly that of *L. titusi*, which was described by Crawford, four years later in 1902.

DISTRIBUTION (Figure 554).—*Lasioglossum pacificum* is presently known from the extreme southwestern corner of British Columbia, including Vancouver Island and south through the coastal and subcoastal areas of Oregon, Washington, and California to Santa Barbara County.

DIAGNOSIS.—The strongly and regularly striate propodeal dorsal surface (Figure 559) will distinguish *Lasioglossum pacificum* from other *Lasioglossum* species except *L. leucozonium*, *L. zonulum*, *L. sisymbrii*, and *L. timberlakei*. *Lasioglossum leucozonium* and *L. zonulum* differ in having relatively longer heads (Figures 492, 555, 734) and in having a conspicuously short propodeal dorsal surface, which is only slightly longer than the metanotum (Figures 496, 738; propodeal surface much longer than the metanotum in *L. pacificum* and most other species). Of the two species, only *L. zonulum* occurs sympatrically with *L. pacificum* and is further differentiated by its sharply pointed lateral pronotal angles (Figure 141; pronotal angles broadly obtuse in *L. pacificum*). The unique first tergal basal hair band (Figure 132) and the pale, translucent tegulae will differentiate *L. sisymbrii*. *Lasioglossum olympiae* is very similar but can be distinguished by its sharply truncated posterior propodeal margin (Figure 536; slightly bowed posteriad in *L. pacificum*, Figure 559), slightly different head shape (Figure 532 vs. Figure 555) and the smooth, relatively polished area immediately dorso-anteriad of the middle coxa (Figure 146; area striolate and dull in *L. pacificum*, Figure 147). The most similar species to *L. pacificum* is *L. timberlakei* (especially the dark form), which can be differentiated by its weak, obscure mesoscutal punctation (Figure 622 vs. Figure 560) and the short, dense pubescence along the posterolateral margin of the mesoscutum (hairs elongate in *L. pacificum*).

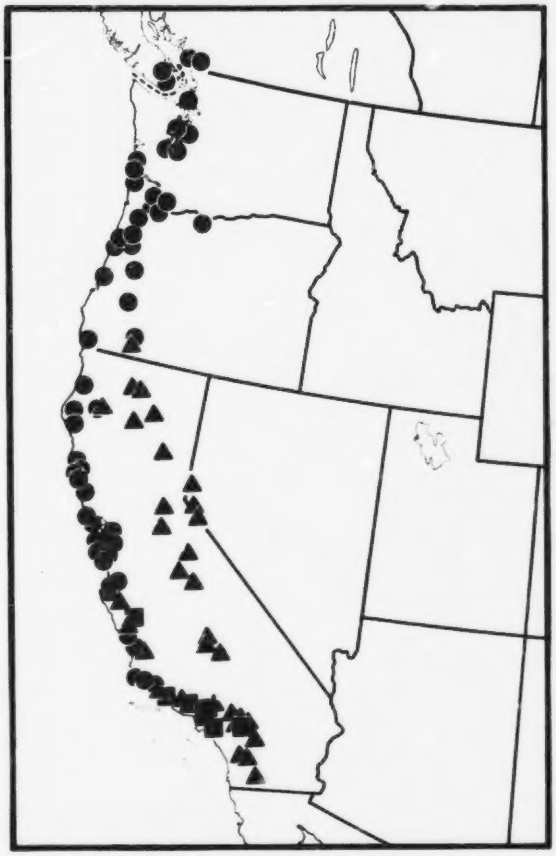
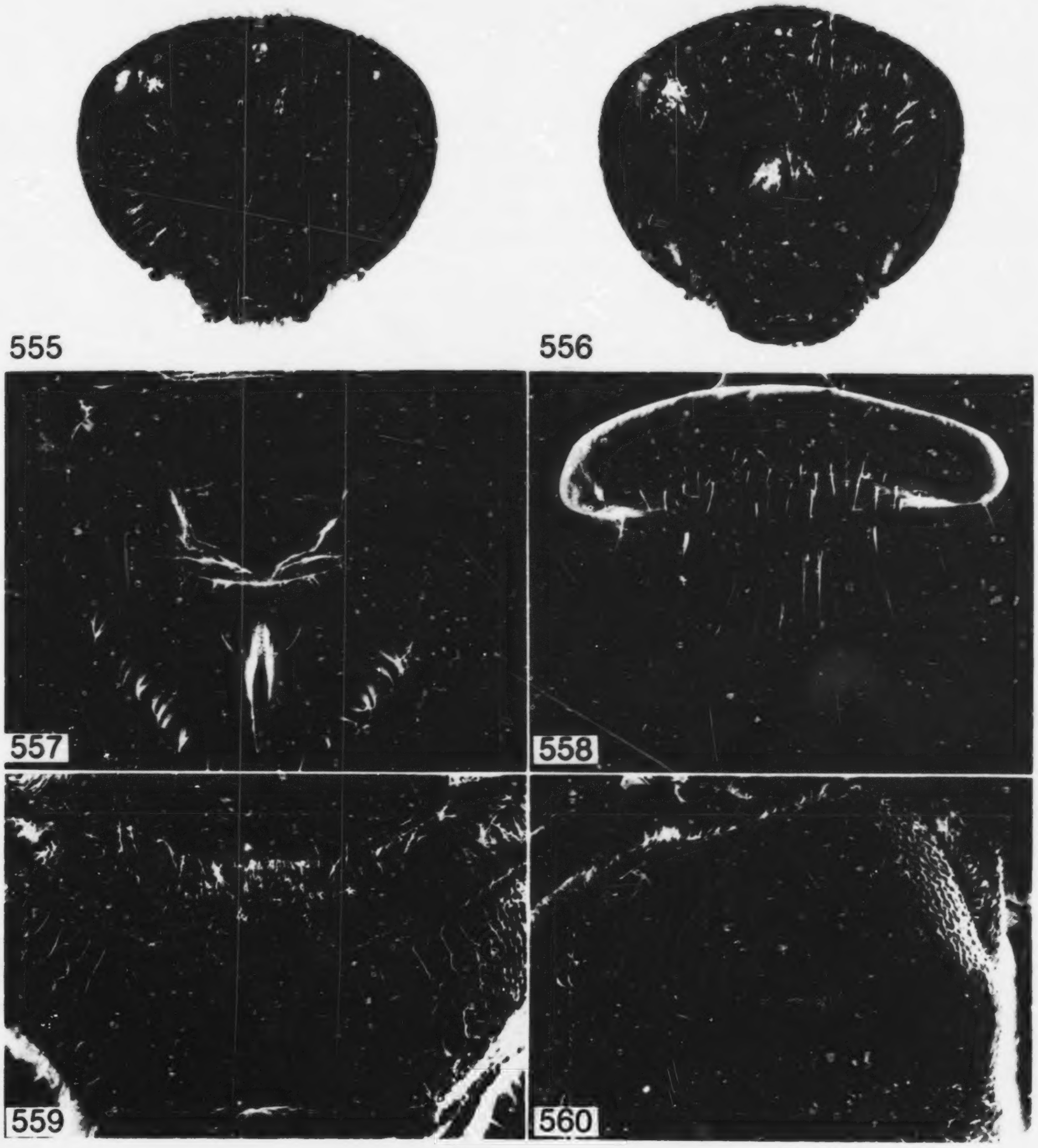


FIGURE 554.—Distribution of *Lasioglossum pacificum* (circle), *L. timberlakei* light form (triangle), and *L. timberlakei* dark form (square).

The presence of elongate hair tufts on the lateral edges of sternum V (Figure 561) will differentiate the males of *L. pacificum* from those of other *Lasioglossum* species except *L. sisymbrii* and *L. timberlakei*. These species also share the lack of a clypeal maculation and have the dorsal propodeal surface strongly striate to rugose. *Lasioglossum sisymbrii* males have a basal white hair band on tergum I as in Figure 132 (absent in *L. pacificum*) and pale, translucent tegulae (dark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Figures 555–560.—*Lasioglossum pacificum:* 555, female head; 556, male head; 557, female labrum; 558, male labrum; 559, female propodeum; 560, female mesoscutum.

brown in *L. pacificum*). *Lasioglossum pacificum* males differ from those of *L. timberlakei* in having well-developed mesoscutal punctation (punctures sparse and obscurely developed in the latter two species). Furthermore, the vestiture of sternum V of both species differs slightly as illustrated in Figures 561, 562.

DESCRIPTION.—FEMALE: (1) Length 8.4–10.8 mm ($\bar{x}$ = 9.7, n= 15); (2) wing length 2.4–2.8 mm ($\bar{x}$ = 2.7, n = 15); (3) abdominal width 2.8–3.4 mm ($\bar{x}$ = 3.2, n = 15).

Structure: (4) Head short (Figure 555; length/width ratio 0.79–0.89, $\bar{x}$ = 0.85, n = 15). (7) Supraclypeal area evenly rounded. (8) weakly protuberant. (9) Clypeus projecting approximately 0.70 of its length below lower margin of eyes; (10) surface without median longitudinal sulcation. (14) Distance between lateral ocelli subequal to distance between lateral ocellus and eye. (23) Flagellomere 1 subequal in length to 2 along dorsal surface. Labrum as in Figure 557; (27) distal keel narrow in frontal view, lateral edges slightly bowed; (28) distal lateral projections virtually absent, evident as obscure swellings; (29) fimbrial setae acutely pointed.

(32) Pronotal lateral angle broadly obtuse; (33) pronotal lateral ridge incomplete, broadly interrupted by oblique lateral sulcus; (34) lower portion of lateral ridge inconspicuous, broadly rounded. (35) Mesoscutal lip rounded, not bilobed, (36) moderately elevated from pronotum. (40) Dorsal surface of propodeum about 0.65 the length of scutellum and subequal to metanotum in length, (41) not depressed centrally, (42) posterior margin truncated (slightly bowed posteriad); (43) propodeal triangle weakly defined laterally; (44) lateral carinae completely encircling posterior surface. (45) Tibial spur as in Figure 44.

(46) Lateral edge of metasomal tergum II very weakly sinuate, posterior two-thirds shallowly concave.

Sculpture: (47) Face shiny, (48) densely punctate below ocelli, punctures contiguous, becoming larger and less dense near antennae. (51) Supraclypeal area extremely granulate; (52) punctures separated by their width laterally, slightly less dense centrally. (53) Clypeus granulate basally and medially to apex, apicolateral areas polished; (54) punctures obscure, separated by less than their width basally, becoming well defined and less dense apically. (56) Mesoscutum shiny; (57) punctation as in Figure 560, punctures 1–2 times their width apart laterally and anteriorly, 2–4 times their width apart centrally. (58) Scutellum with conspicuous impunctate areas adjacent to median line. (63) Dorsal surface of propodeum (Figure 559) strongly and completely striate to porcate, striae evenly spaced with very few obscure transverse rugulae; (64) surface smooth, not alveolated. (65) Metasomal tergum I shiny; (66) punctation extremely fine, sparse posteriorly, punctures 2–3 times their width apart, punctures scattered anteriorly with large impunctate areas.

Coloration: (71) Wing membrane nearly hyaline, very lightly pigmented.

Vestiture: (74) Pubescence of head golden. (75) Pubescence of thorax golden; (76) mesoscutal hairs moderately dense, very conspicuously plumose. (77) Hind tibial hairs concolorous, golden. (78) Anterior hairs of metasomal tergum I and (79) basal hair bands of terga II–IV yellowish white. (80) Acarinarium absent, elongate hairs scattered over anterior surface of tergum I. (81) Unlike other species, basal hair band of tergum II interrupted medially.

MALE: Similar to female except as follows: (1) length 7.3–9.0 mm ($\bar{x}$ = 8.0, n = 15); (2) wing length 2.1–2.4 mm ($\bar{x}$ = 2.3, n = 15); (3) abdominal width 2.0–2.6 mm ($\bar{x}$ = 2.3, n = 15). (4) Head as in Figure 556 (length/width ratio 0.83–0.92, $\bar{x}$ = 0.87, n = 15). (5) Gena subequal to eye in width, (6) rounded, not produced posteriorly. (10) Clypeal surface broadly rounded, not flattened or depressed. Labrum as in Figure 558; (24) distal process very weakly developed, broadly rounded; (25) basal area rounded medially, not depressed; (26) basal lateral depressions absent. (30) Mandible very short, not reaching opposing clypeal angle. (53) Clypeus weakly granulate, shiny; (54) punctation nearly uniform

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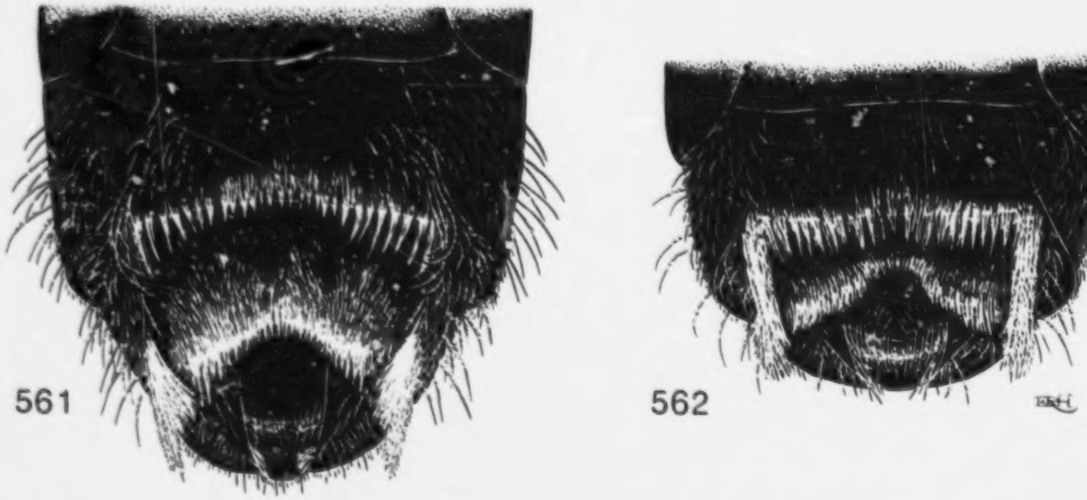


FIGURES 561, 562.—Male sternal vestiture: 561, *L. pacificum;* 562, *L. timberlakei.*

throughout, punctures separated by 1–2 times their width. (68) Clypeal maculation absent. (69) Flagellum entirely dark to pale yellowish orange ventrally and contrasting with dark dorsum. (72) Tarsi dark, concolorous with tibiae.

Vestiture: Sternal vestiture as in Figure 561; (82) hairs on sternum IV short, adpressed, with noticeable hair fringe on posterior sternal edge; (83) sternum V with rounded hair fringe on posterior sternal edge, hairs becoming elongate laterally, forming conspicuous lateral tufts.

Terminalia: Sterna VII–VIII as in Figure 567; (85) sternum VIII without median process, distal edge of disc sharply truncated. Genitalia as in Figures 563–566; (86) gonobase moderately elongate; (87) gonostylus moderately elongate, robust, bluntly rounded; (89) retrorse membranous lobe extremely reduced, slender; (90) volsella with weakly developed lateral flange but lacking prominent lateral lobe.

FLIGHT RECORDS (Figure 568).—*Lasioglossum pacificum* females have been collected from February to late November, with most records from late May and June. Male records range from late June to early October, with a southwestern peak in early August and a northwestern peak in early September.

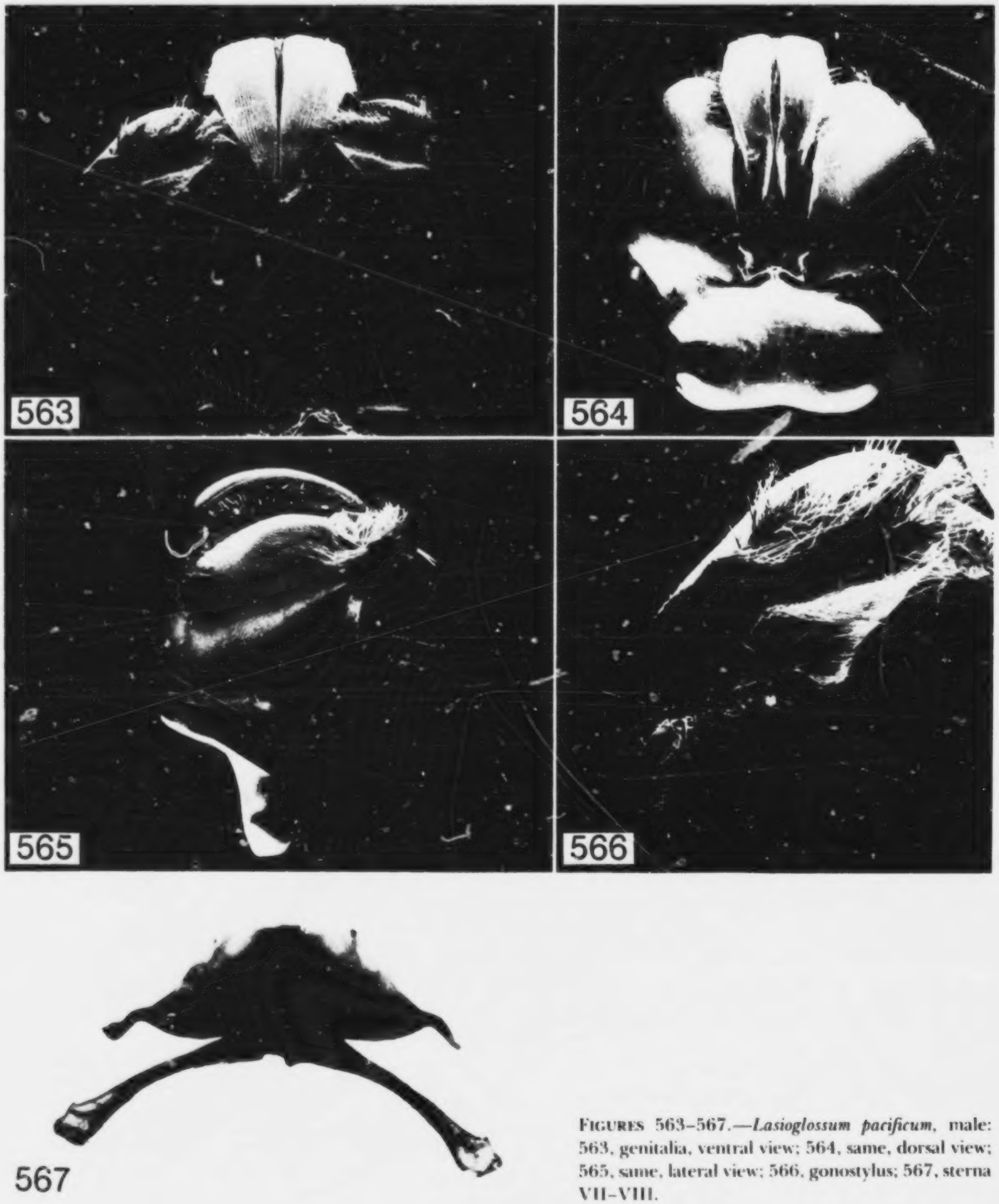
FLOWER RECORDS.—Females (41): Ranunculaceae 15%; Cruciferae 12.5%; Compositae 12.5%; Scrophulariaceae 12.5%; Umbelliferae 12.5%. Males (7): Compositae 88%; Convolvulaceae 12%. Total: 48 in 14 families, 22 genera as follows:

Achillea 1♀, 5♂; *Anaphalis* 1♀, 20♂; *Angelica* 2♀; *Brassica* 5♀; *Chrysanthemum* 1♀; *Cichorium* 1♀; *Cicuta* 1♀; *Convolvulus* 1♂; *Cornus* 1♀; **Heracleum* 2(1)♀; *Iris* 1♀; *Myosotis* 1♀; **Orthocarpus* 4(4)♀; *Poa* 1♀; **Potentilla* 1(1)♀; **Ranunculus* 6(1)♀; **Rhododendron* 4(4)♀; *Rubus* 1♀; **Salix* 4(1)♀; *Scrophularia* 1♀; *Stellaria* 1♀; *Taraxacum* 1♀.

SPECIMENS EXAMINED.—663 (541♀, 122♂).

CANADA. BRITISH COLUMBIA: Agassiz, Miracle Beach (near Oyster river), Mission City, Nanaimo Biology Station, Royal Oak, Saanich, Sooke, Vancouver, Victoria, Wellington.

UNITED STATES. CALIFORNIA: *Alameda Co.; Contra Costa Co.:* Fish Ranch Road, Orinda (4 mi NW), Walnut Creek; *Humboldt Co.; Marin Co.; Mendocino Co.; Monterey Co.; San Benito Co.:* Prunedale, 8 mi N; *San Francisco Co.; San Luis Obispo Co.:* Cambria, Grover City, Ocean, 3 mi S; *San Mateo Co.; Santa Barbara Co.:* Goleta, Jalama Beach, Santa Ynez River (Highway 101); *Santa Clara Co.:* San Jose, Palo Alto; *Santa Cruz Co.; Sonoma Co.:* Mesa Grande, Pitkin Marsh, Plantation (4 mi W), Valley Ford, 2 mi SE; *Trinity Co.:* Weaverville, 47 mi W. OREGON: *Benton Co.:* Corvallis; *Clackamas Co.:* Oswego; *Clatsop Co.:* Olney; *Columbia Co.:* St. Helens-Scappoose; *Curry Co.:* Brookings, Pistol River; *Doug-*



FIGURES 563–567.—*Lasioglossum pacificum*, male: 563, genitalia, ventral view; 564, same, dorsal view; 565, same, lateral view; 566, gonostylus; 567, sterna VII–VIII.

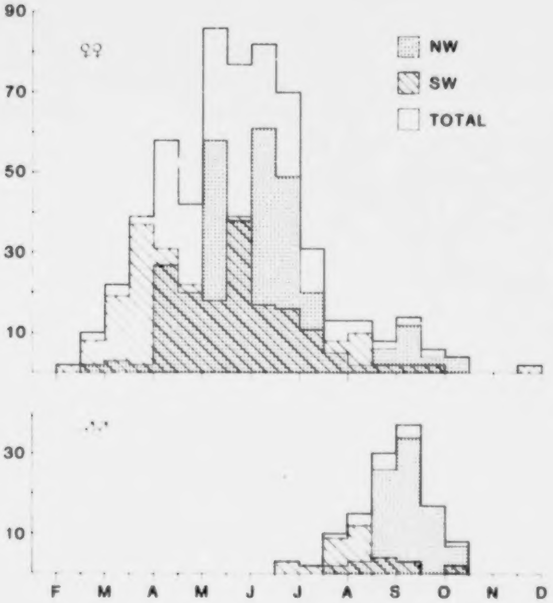


FIGURE 568.—*Lasioglossum pacificum* flight records.

las Co.: Roseburg (7 mi NW), Winchester Bay; *Jackson Co.:* Butte Falls (10 mi SE), Griffin Creek; *Lane Co.*, Eugene; *Lincoln Co.; Multnomah Co.:* Portland; *Polk Co.:* Monmouth; *Wasco Co.:* The Dalles; *Washington Co.:* Forest Grove; *Yamhill Co.:* Sheridan. WASHINGTON: *Clark Co.:* Vancouver; *Island Co.:* Coupeville; *King Co.:* Northbend, Seattle; *Kitsap Co.:* Illahee, Seabeck; *Pacific Co.; Pierce Co.:* Fort Lewis, Pleasant Valley; *Thurston Co.:* Olympia.

32. *Lasioglossum pallicorne* (Vachal)

FIGURES 45, 569–581

Halictus pallicornis Vachal, 1904:477 [male].—Cockerell, 1905a:90 [key].
Lasioglossum pallicorne.—Moure and Hurd, 1986:63 [catalog].

TYPE MATERIAL.—The male holotype, deposited in the Paris Museum (MNHNP), is labeled

Mexico t.f./MUSEUM PARIS COLL. O.SICHEL 1867/HOLOTYPE [handwritten on red label]/H.[alictus]♂ pallicornis Vach.[al] handwritten by Vachal?]/Halictus pallicornis Vach. [recent label].

The specimen is in good condition except for missing the last 10 flagellomeres of the left antenna and having the body hairs soiled. However, the diagnostic hair pattern of sternum V (Figure 576) is clearly visible.

DISTRIBUTION (Figure 569).—The known distribution of *L. pallicorne* is similar to that of *L. transvorsum* in being limited to a small area around Mexico City from Michoacan to Veracruz. The species is presently known from 16 females and 34 males.

DIAGNOSIS.—The structure of the metasomal acarinarium (Figure 578) makes the females of *L. pallicorne* among the most distinctive of New World *Lasioglossum*. The acarinarium is a heart-shaped, bilateral depression enclosed laterally by a thick canopy of fringe hairs. The area immediately posteriad of the acarinarium is conspicuously hairless (this bald area is also noticeable in the males). The acarinaria of all other mite-carrying *Lasioglossum* are never heart-shaped and have only lateral hair fringes that never form a canopy enclosing the acarinarial surface. Other characters helpful in recognizing females of *L. pallicorne* are the well-developed, elevated posterior rim of the relatively elongate propodeal dorsal surface (Figure 574), the complete pronotal lateral ridge (Figure 577), and the short head (Figure 570).

Males of *L. pallicorne* are unique in having conspicuously elongate and curled hairs on the extreme lateral edges of sternum V (Figure 576). Like the females the pronotal lateral ridge is complete and there is an extensive hairless area across the anterior surface of the first metasomal tergum. The propodeal dorsal surface is elongate but usually lacks the elevated posterior rim that is found in the females.

DESCRIPTION.—FEMALE: (1) Length 6.8–8.7 mm ($\bar{x}$ = 7.8, n = 12); (2) wing length 2.1–2.4 mm ($\bar{x}$ = 2.3, n = 12); (3) abdominal width 2.2–2.8 mm ($\bar{x}$ = 2.5, n = 12).

Structure: (4) Head short (Figure 570); length/width ratio 0.78–0.96, $\bar{x}$ = 0.87, n = 12. (7) Supraclypeal area evenly rounded, (8) moderately protuberant. (9) Clypeus projecting approximately 0.76 of its length below lower margin of eyes; (11) surface without median longi-

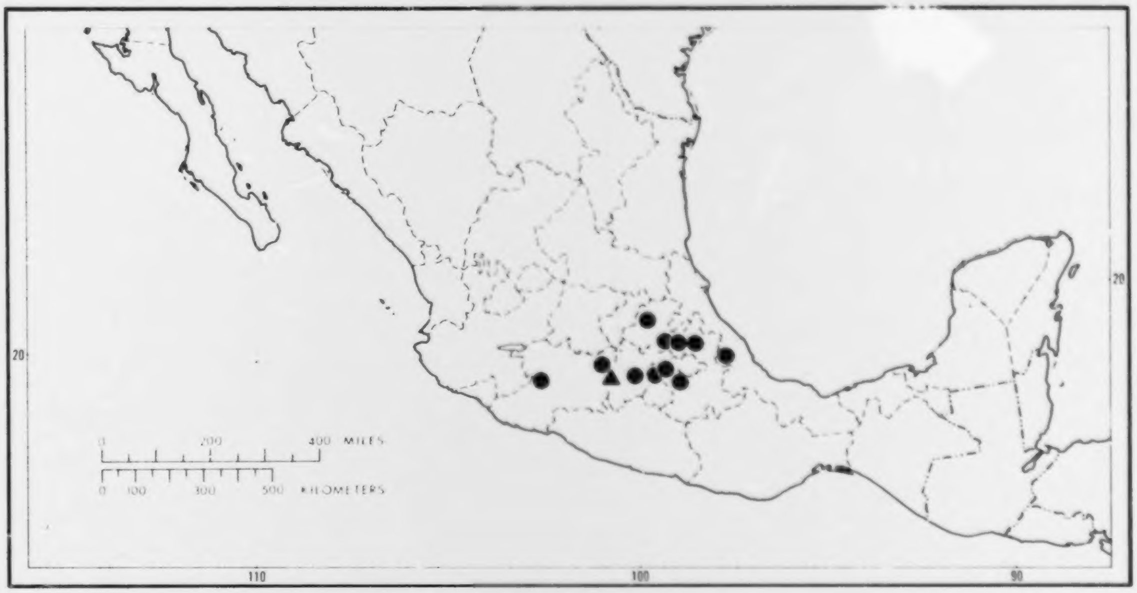


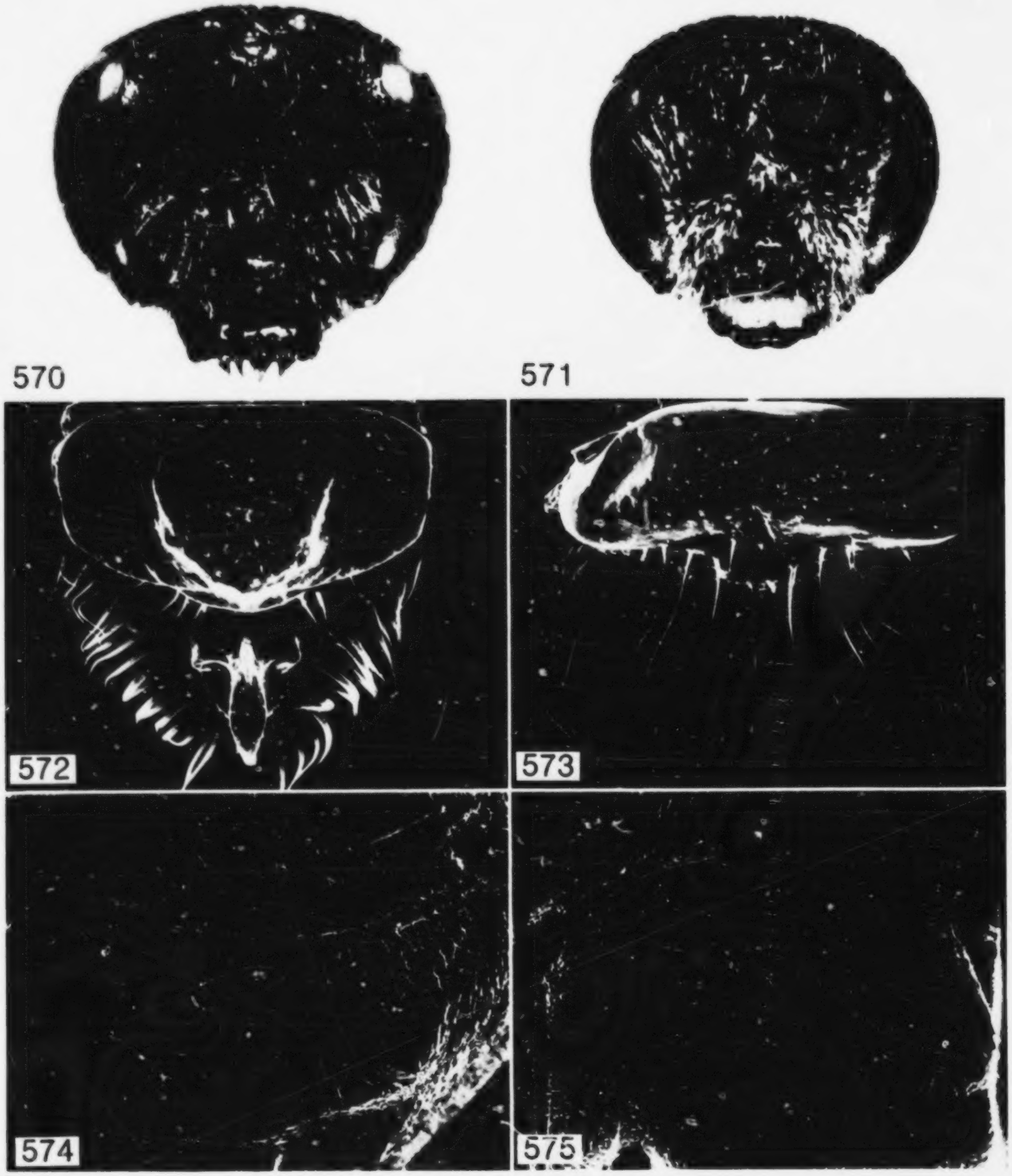
FIGURE 569.—Distribution of *Lasioglossum pallicorne* (circle) and *L. parkeri* (triangle).

tudinal sulcation. (14) Distance between lateral ocelli subequal to distance between lateral ocellus and eye. (23) Flagellomere 1 subequal to 2 in length along dorsal surface. Labrum as in Figure 572; (27) distal keel broad in frontal view, somewhat spoon-shaped, with conspicuous basal median groove; (28) distal lateral projections well developed, triangular; (29) fimbrial setae acutely pointed.

(32) Pronotal lateral angle broadly obtuse; (33) pronotal lateral ridge complete, slightly notched by oblique lateral sulcus but not distinctly interrupted; (34) lower portion of lateral ridge sharply edged near oblique sulcus, becoming narrowly rounded ventrally. (35) Mesoscutal lip weakly bilobed, (36) moderately elevated from pronotum. (40) Dorsal surface of propodeum very elongate, about 0.95 the length of scutellum and about 1.7 times the length of metanotum, (41) depressed centrally, (42) posterior margin rounded; (43) propodeal triangle well defined medially by a sharply edged V-shaped elevation with conspicuous lateral rims, becoming faint towards metanotum; (44) lateral carinae extending at most one-third the length of posterior surface. (45) Tibial spur as in Figure 45.

(46) Lateral edge of metasomal tergum II only faintly sinuate, virtually straight.

Sculpture: (47) Face shiny, (48) densely and uniformly punctate between ocelli and antennae, punctures contiguous. (51) Supraclypeal area extremely granulate; (52) punctation extremely sparse with few, scattered punctures. (53) Clypeus strongly granulate basally, apical two-thirds moderately polished; (54) punctures obscure basally, separated by their width over apical half. (56) Mesoscutum shiny; (57) punctation as in Figure 575, punctures dense laterally and anteriorly, punctures separated by less than their width, becoming less dense centrally, punctures separated by 1–2 times their width. (58) Scutellar punctation nearly uniform, only slightly less punctate adjacent to median line with punctures 1–2 times their width apart. (63) Dorsal surface of propodeum (Figure 574) mostly smooth centrally, basal one-third, lateral areas and posterior edge ruguloso-striolate; (64) surface extensively alveolated. (65) Metasomal tergum I moderately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FIGURES 570–575.—*Lasioglossum pallicorne:* 570, female head; 571, male head; 572, female labrum; 573, male labrum; 574, female propodeum; 575, female mesoscutum.

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shiny; (66) punctation fine, extremely dense, punctures nearly contiguous; surface impunctate and noticeably granulate posteriad to acarinarial hair fringes.

Coloration: (71) Wing membrane pale yellowish brown.

Vestiture: (74) Pubescence of head pale yellowish brown. (75) Pubescence of thorax yellowish brown; (76) mesoscutal hairs moderately dense and plumose. (77) Hind tibial hair color weakly differentiated, most hairs pale yellowish brown, dorsal hairs light brown. (78) Anterior hairs of metasomal tergum I pale yellowish brown, (79) basal hair bands of terga II–IV white. (80) Acarinarium present (Figures 162, 578), unlike other species a bilaterally depressed, heart-shaped, glabrous area, surrounded and enclosed laterally by elongate fringe hairs; dorsal opening of acarinarium extremely narrow, at most 0.25 the width of lateral hair fringe; with conspicuous hairless area posteriad to fringe hairs.

MALE: Similar to female except as follows: (1) length 6.2–7.9 mm ($\bar{x}$ = 2.0, n = 15); (2) wing length 1.7–2.3 mm ($\bar{x}$ = 2.0, n = 15), (3) abdominal width 1.7–2.1 ($\bar{x}$ = 1.9, n = 15). (4) Head as in Figure 571 (length/width ratio 0.86–0.95, $\bar{x}$ = 0.90, n = 15). (5) Gena slightly wider than eye; (6) moderately produced posteriorly. (10) Clypeal surface shallowly depressed ventrally. Labrum as in Figure 573; (24) distal process weakly developed, rounded; (25) basal area moderately depressed medially; (26) basal lateral depressions conspicuously developed. (30) Mandible short, just reaching opposing clypeal angle. (53) Clypeus polished; (54) punctures well formed, nearly contiguous basally, larger and scattered over apical two-thirds. (68) Clypeal maculation present. (69) Flagellum entirely dark or only slightly paler ventrally than on dorsum. (72) Tarsi dark, concolorous with tibiae.

Vestiture: Sternal vestiture as in Figure 576; (82) hairs on sternum IV moderately elongate medially, directed laterally from midline, gradually becoming elongate on lateral edge of sternum; (83) vestiture of sternum V similar to that of sternum IV but with two to five conspicuously elongate and curled hairs on posterolateral sternal edge.

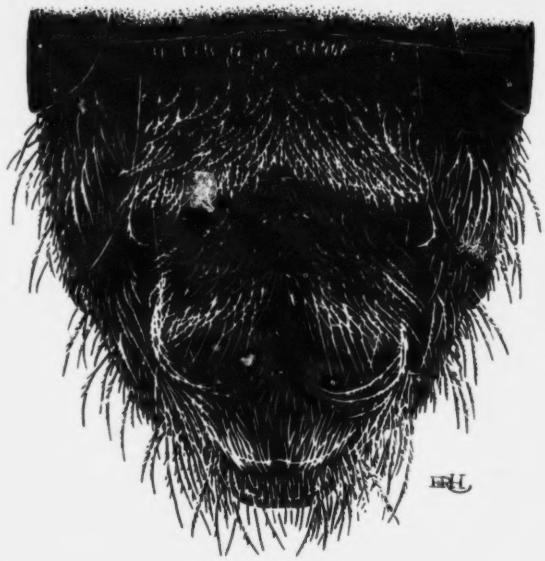


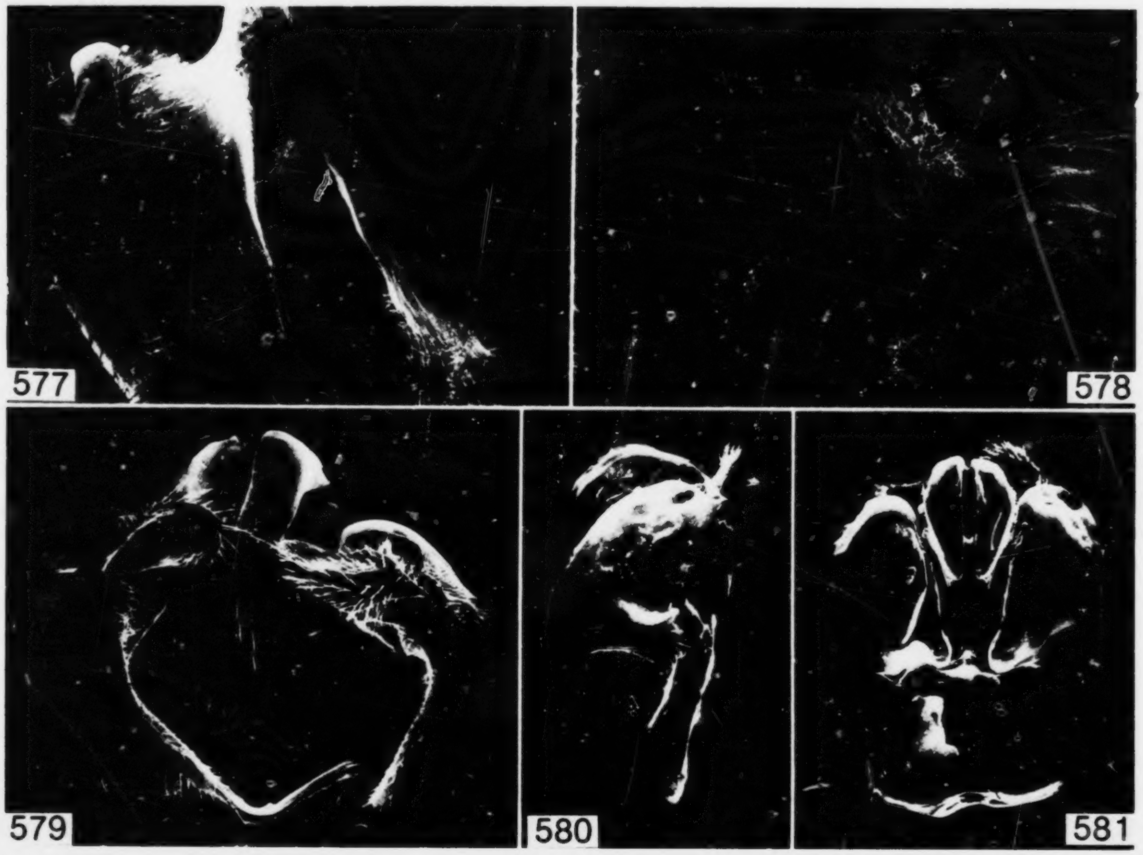
FIGURE 576.—*Lasioglossum pallicorne*, male sternal vestiture.

Terminalia: (85) Sternum VIII with moderately elongate, slender median process, rounded apically. Genitalia as in Figures 579–581; (86) gonobase elongate; (87) gonostylus elongate, expanding to conspicuous bulbous apex; (89) retrorse membranous lobe extremely slender; (90) volsella with prominent lateral lobe.

FLIGHT RECORDS.—*Lasioglossum pallicorne* females have been collected from late June through August. Most male records are from May, with additional records from June and July. Little can be said of *L. pallicorne* flight activity, because of the limited number of specimens currently available for study.

FLOWER RECORDS.—One female from the state of Mexico taken on *Heterotheca chrysopsidis* and another female from Puebla taken on *Heterotheca* sp.

MITE ASSOCIATES.—As described in the diagnosis and description (character 80), the acarinarium of the *L. pallicorne* female is the most



FIGURES 577–581.—*Lasioglossum pallicorne:* 577, female pronotum, lateral view; 578, female acarinarium at base of tergum I; 579, male genitalia, ventral view; 580, same, lateral view; 581, same, dorsal view.

elaborate of all known *Lasioglossum* species (Figure 578). Of the examined females, 81.2% had hypopodes in their acarinarium. Although the sample is limited at present, an unusually high number of the males (60.6%) carried mites. Unlike all other *Lasioglossum* species, mites on *L. pallicorne* males form conspicuously dense, shingled rows and are found exclusively on the genae. The regularity of positioning on the males, the relatively high number of males carrying hypopodes, and the conspicuous development of the female acarinarium suggest a very close association between *L. pallicorne* and its phoretic mites.

SPECIMENS EXAMINED.—49 (16♀, 33♂).

MEXICO. DISTRITO FEDERAL: Tlalpam, 21 Jul 1947, Helmuth and Wagner (1♂; UMMZ); Topilego, 16 May 1959, 9000 ft, H.E. Evans (22♂; CU); Xochimilco, 22 Jul 1947, Helmuth and Wagner (2♂; UMMZ), 18 Aug 1962, 8000 ft, H.E. Milliron (1♀; CNC). HIDALGO: Tulancingo, 6 mi E, 24 Aug 1962, 6900 ft, Ordway and Roberts (1♀; KU); Zacatlan, 23.6 mi NW, 22 Aug 1962, 6650 ft, Univ. Kansas Mex. Exped. (1♀; KU); Zimapan, 8 mi NE, 28 Jul 1954, 4600 ft, J.G. Chillcott (1♀; CNC). MEXICO: Mexicaltcingo, 5 Jul 1961, 8450 ft, Univ. Kansas Mex. Exped. (1♀; KU); Texcoco, 11 mi W, 20 Jun 1962, D.H. Janzen (1♀; CU); Toluca, 20 mi E, 31 Jul 1954, 8900 ft, Univ. Kansas Mex. Exped. (1♀; KU), 15.5 mi E, 6 Jul 1961, 9500 ft, Univ. Kansas Mex. Exped. (1♀; 1♂, KU), 9 mi E, 23 Jun 1963, 9600 ft, Scullen and Bolinger (7♂; OrS). MICHOACAN: Hidalgo, 12 Jul 1963, F.D. Parker, L.A. Stange (1♀; UCD), 17 mi N, 29 Jul 1962, Univ.

Kansas Mex. Exped. (1♀; KU), near Zirosto, 23 Jun 1947, T.H. Hubbell, (1♀; UMMZ); Tancitaro, 27 Jul 1940, 6000 ft, H. Hoogstraal (1♀; AMNH). Puebla: Texmelucan, 14 mi W, 14 Jul 1953, 8600 ft, Univ. Kansas Mex. Exped. (1♀; KU); Zacatlan, 6 mi NW, 22 Aug 1962, 8000 ft, Ordway and Roberts (1♀; KU). Veracruz: Las Vigas, 14–15 Jul 1974, 2070 m, J.A. Chemsak, E.G. Linsley, J. Powell (1♀; UCB); Perote, 2 km NE, 14 Jul 1974, J.A. Chemsak, E.G. Linsley, J. Powell (1♀; UCB).

33. *Lasioglossum parkeri*, new species

Figures 569, 582

Type Material.—The female holotype of *L. parkeri* is deposited in the University of California at Davis and is labeled

10 mi. east Zitacuaro Mich.[oacan] MEX.[ico] III [Mar] 26 1962/F.D. Parker L.A. Stange Collectors/HOLOTYPE Lasioglossum parkeri R.J. McGinley [red label].

When received, the abdomen was loosely attached to the thorax and is now contained in a micro-vial pinned with the specimen (gluing the abdomen may have obscured details of the diagnostic acarinarium). The specimen is otherwise in excellent condition.

Etymology.—This species is named after F.D. Parker (Bee Biology and Systematics Laboratory and Utah State University), who along with L.A. Stange (Florida State Collection of Arthropods, Gainesville) collected the unique female holotype.

Distribution (Figure 569).—This species is presently known only from the type-locality: 10 miles east of Zitacuaro, Michoacan (on the border of the state of Mexico).

Diagnosis.—The female of this species can be recognized by its distinctive acarinarium (at the base of abdominal tergum I), which is a concave, circular, glabrous surface completely surrounded by erect fringe hairs (Figure 582). The only other New World *Lasioglossum* with an acarinarium completely surrounded by fringe hairs is *L. coriaceum*, a species from the eastern United States. The fringe hairs of *L. coriaceum* are adpressed, not erect (Figure 72). *Lasioglossum parkeri* appears to be related to the Mexican *L. pallicorne* as evidenced by the unusual dorsal propodeal surface that is surrounded by conspicuously elevated lateral rims (as in Figure 574). Like *L. pallicorne*, the propodeal dorsal surface is smooth (conspicuously alveolated) over its posterior half, the head is short (similar to Figure 570), and the mesoscutal punctation is dense but not quite granuloso-punctate (as in Figure 575). *Lasioglossum pallicorne* is easily differentiated from *L. parkeri* by its bilaterally depressed, heart-shaped acarinarium (Figure 578).

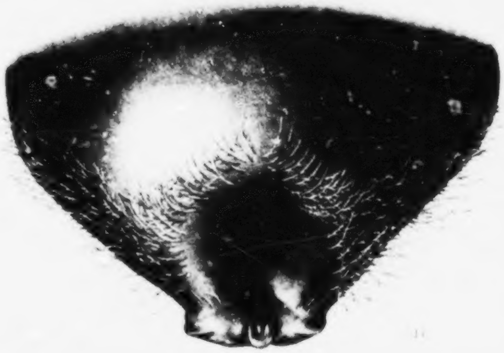


Figure 582.—*Lasioglossum parkeri*, female acarinarium at base of tergum I.

Description.—Female: (1) Length 8.8 mm (n = 1); (2) wing length 2.5 mm; (3) abdominal width 2.7 mm.

Structure: (4) Head short (similar to that of *L. pallicorne*, Figure 570); length/width ratio 0.83. (7) Supraclypeal area evenly rounded, (8) moderately protuberant. (9) Clypeus projecting approximately 0.67 of its length below lower margin of eyes; (11) surface without median longitudinal sulcation. (14) Distance between lateral ocelli slightly shorter than distance between lateral ocellus and eye. (23) Flagellomere 1 subequal to 2 in length along dorsal surface. Labrum similar to that of *L. pallicorne* (Figure 572) but (27) distal keel not so broad, basal median groove not so conspicuous, (28) distal lateral projections small, triangular; (29) fimbrial setae acutely pointed.

(32) Pronotal lateral angle broadly obtuse; (33) pronotal lateral ridge appearing complete, only

slightly notched by oblique lateral sulcus but not distinctly interrupted; (34) lower portion of lateral ridge sharply edged. (35) Mesoscutal lip weakly bilobed, (36) moderately elevated from pronotum. (40) Dorsal surface of propodeum very elongate, about 0.92 the length of scutellum and about 1.6 times the length of metanotum, (41) depressed centrally, (42) posterior margin rounded; (43) propodeal triangle well defined medially by a sharply edged V-shaped elevation with conspicuous lateral rims, becoming faint towards metanotum; (44) lateral carinae extending at most one-third the length of posterior surface. (45) Tibial spur similar to that of *L. pallicorne* (Figure 45).

(46) Lateral edge of metasomal tergum II only faintly sinuate, virtually straight.

Sculpture: (47) Face shiny, (48) densely and uniformly punctate between ocelli and antennae, punctures contiguous. (51) Supraclypeal area moderately granulate; (52) punctation extremely sparse with few, scattered punctures. (53) Clypeus moderately granulate basally, apical two-thirds moderately polished; (54) punctures obscure basally, separated by their width over apical half. (56) Mesoscutum shiny; (57) punctation similar to that in Figure 575, punctures dense, nearly contiguous laterally and anteriorly, punctures becoming slightly less dense centrally, punctures separated by their width or slightly less. (58) Scutellum largely impunctate centrally. (63) Dorsal surface of propodeum similar to that of *L. pallicorne* (Figure 574), ruguloso-striolate on basal half, smooth on posterior half; (64) surface extensively alveolated. (65) Metasomal tergum I moderately shiny; (66) punctation fine, extremely dense, punctures nearly contiguous; surface nearly glabrous posteriad to acarinarial hair fringes (Figure 582).

Coloration: (71) Wing membrane pale yellowish brown.

Vestiture: (74) Pubescence of head pale yellowish brown. (75) Pubescence of thorax yellowish brown; (76) mesoscutal hairs moderately dense and plumose. (77) Hind tibial hair color differentiated, most hairs on dorsal surface brown, hairs yellowish brown on ventral and lateral surfaces. (78) Anterior hairs of metasomal tergum I pale yellowish brown, (79) basal hair bands of terga II–IV yellowish white. (80) Acarinarium present (Figure 582), a concave, circular, glabrous area, completely surrounded by erect fringe hairs; area posteriad of acarinarium conspicuously hairless.

MITE ASSOCIATES.—The one female available for study had her acarinarium partially filled with histiostomatid hypopodes.

SPECIMENS EXAMINED.—One holotype female, Zitacuaro, 10 mi E, Michoacan, Mexico, 26 Mar 1962, F.D. Parker and L.A. Stange (UCD).

34. *Lasioglossum pavonotum* (Cockerell)

FIGURES 47, 583–597

Halictus pavonotus Cockerell, 1925:188 [female, male].

Lasioglossum pavonotum.—Michener, 1951:1107 [Nearctic catalog].—Moldenke and Neff, 1974:55 [locality and flower records].—Hurd, 1979:1957 [Nearctic catalog].

TYPE MATERIAL.—The female holotype of *Halictus pavonotus* is in the California Academy of Sciences, San Francisco. It is in excellent condition and is labeled

San Francisco Cal.[ifornia] III-[March] 30-1913/E.C. Van Dyke Collectir [sic]/Halictus pavonotus Ckll. [Cockerell] TYPE [handwritten by Cockerell]/California Academy of Sciences Type No. 1650.

DISTRIBUTION (Figure 583).—*Lasioglossum pavonotum* is known only from sandy habitats immediately along the Pacific coastline and sandbanks along the Sacramento River. It is presently known only from Pacific County, Washington, south to Orange County, California, including San Miguel Island.

DIAGNOSIS.—Both sexes of *Lasioglossum pavonotum* are the only metallic blue-green bees of this genus in the New World. All other *Lasioglossum* species in the New World are dark brown to black, never metallic.

DESCRIPTION.—FEMALE: (1) Length 7.3–9.1 mm ($\bar{x}$ = 8.2, n = 15); (2) wing length 1.9–2.8

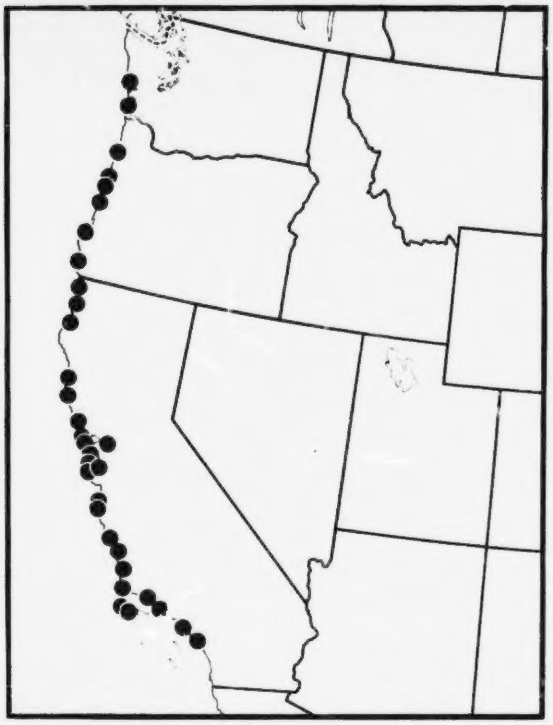


FIGURE 583.—Distribution of *Lasioglossum pavonotum*.

mm ($\bar{x}$ = 2.2, n = 15); (3) abdominal width 2.2–3.0 mm ($\bar{x}$ = 2.7, n = 15).

Structure: (4) Head elongate (Figure 584; length/width ratio 0.84–0.96, $\bar{x}$ = 0.92, n = 15). (7) Supraclypeal area evenly rounded, (8) moderately protuberant. (9) Clypeus projecting approximately 0.93 of its length below lower margin of eyes; (11) surface without median longitudinal sulcation. (14) Distance between lateral ocelli subequal to distance between lateral ocellus and eye. (23) Flagellomere 1 slightly longer than 2 along dorsal surface. Labrum as in Figure 586; (27) distal keel narrow in frontal view, nearly parallel-sided; (28) distal lateral projections well developed, rounded; (29) fimbrial setae acutely pointed; unlike other species, basal elevation of labrum not developed.

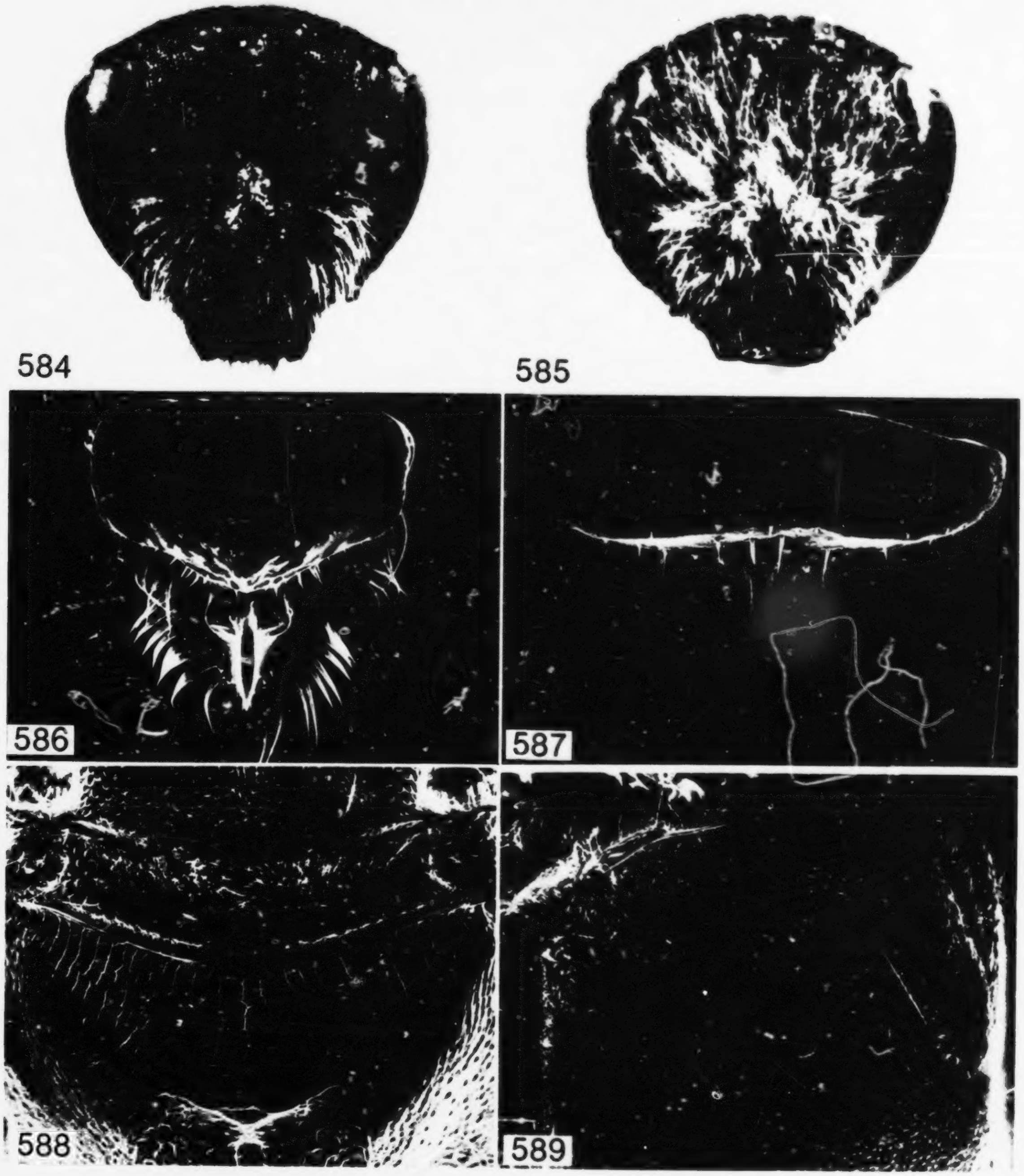
(32) Pronotal lateral angle narrowly obtuse; (33) pronotal lateral ridge incomplete, broadly interrupted by oblique lateral sulcus; (34) lower portion of lateral ridge inconspicuous, broadly rounded. (35) Mesoscutal lip weakly bilobed, (36) moderately elevated from pronotum. (40) Dorsal surface of propodeum about 0.75 the length of scutellum and about 1.2 times the length of metanotum, (41) slightly depressed centrally, (42) posterior margin broadly rounded; (43) propodeal triangle weakly defined laterally, evident medially as a conspicuous, sharply edged V-shaped elevation with lateral rims, fading towards metanotum; (44) lateral carinae extending to or slightly beyond midpoint of posterior surface. (45) Tibial spur as in Figure 47.

(46) Lateral edge of metasomal tergum II broadly rounded with posterior half somewhat truncated.

Sculpture: (47) Face shiny, (48) densely punctate below ocelli, punctures contiguous, becoming only slightly larger and less dense near antennae. (51) Supraclypeal area extremely granulate; (52) punctures separated by their width laterally, becoming less dense centrally. (53) Clypeus granulate basally, apical half weakly granulate, somewhat polished; (54) punctures obscure, becoming very sparse apically. (56) Mesoscutum shiny; (57) punctation as in Figure 589, punctation uniform, contiguous, becoming granuloso-punctate anteriorly. (58) Scutellum nearly uniformly punctate, punctures less dense than those of mesoscutum, separated by their width or slightly less. (63) Dorsal surface of propodeum (Figure 588) striolate to ruguloso-striolate laterally, becoming rugulose medially, striae and rugulae reaching posterior margin only laterally; (64) surface alveolated. (65) Metasomal tergum I shiny, granulate; (66) punctation extremely fine, obscure, moderately sparse posteriorly, punctures 1–2 times their width apart, surface impunctate centrally and anteriorly (forming weakly developed acarinarium, see species discussion).

Coloration: (71) Wing membrane hyaline.

Vestiture: (74) Pubescence of head white. (75) Pubescence of thorax white; (76) mesoscutal hairs moderately dense, conspicuously plumose. (77) Hind tibial hair color very weakly differentiated, hairs mostly white, dorsal hairs light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FIGURES 584–589.—*Lasioglossum pavonotum:* 584, female head; 585, male head; 586, female labrum; 587, male labrum; 588, female propodeum; 589, female mesoscutum.

brown. (78) Anterior hairs of metasomal tergum I and (79) basal hair bands of terga II–IV white. (80) Acarinarium not obviously developed (mites attach to impunctate median area of tergum I, base of tergum I with scattered elongate hairs as in non-mite-carrying species, Figure 591); metasoma highly unique in having lateral patches of adpressed, short, white hairs at anterior edges of tergum I (similar to basal hair band of *L. sisymbrii* but interrupted), apical edges of metasomal terga with short white hair fringe; basal hair bands of terga II–IV weakly defined, that of tergum IV nearly covering entire surface.

MALE: Similar to female except as follows: (1) length 6.7–8.4 mm ($\bar{x} = 7.4$, $n = 15$); (2) wing length 1.7–2.2 mm ($\bar{x} = 1.9$, $n = 15$); (3) abdominal width 1.6–2.1 mm ($\bar{x} = 1.9$, $n = 15$). (4) Head as in Figure 585 (length/width ratio 0.86–0.95, $\bar{x} = 0.91$, $n = 15$). (5) Gena subequal to eye in width, (6) rounded, not produced posteriorly. (10) Clypeal surface with conspicuous median depression on ventral half. Labrum as in Figure 587; (24) distal process very weakly developed, rounded; (25) basal area rounded medially, not depressed; (26) basal lateral depressions absent. (30) Mandible very short, not quite reaching opposing clypeal angle. (53) Clypeus polished; (54) punctation nearly uniform throughout, punctures slightly less dense apically and on apical median depression. (68) Clypeal maculation absent. (69) Flagellum slightly paler on venter than on dark dorsum. (72) Tarsi dark, concolorous with tibiae.

Vestiture: Sternal vestiture as in Figure 590; (82) hairs on sternum IV adpressed, elongate, curling inward towards midline; (83) hairs on sternum V similar to those on sternum V but with median rosette of short hairs.

Terminalia: Sterna VII–VIII as in Figure 596; (85) sternum VIII without median process. Genitalia as in Figures 592–595; (86) gonobase moderately short; (87) gonostylus enormous, subequal in size to retrorse membranous lobe; (89) retrorse membranous lobe moderately slender, conspicuously hairy; (90) volsella with broadly rounded lateral lobe.

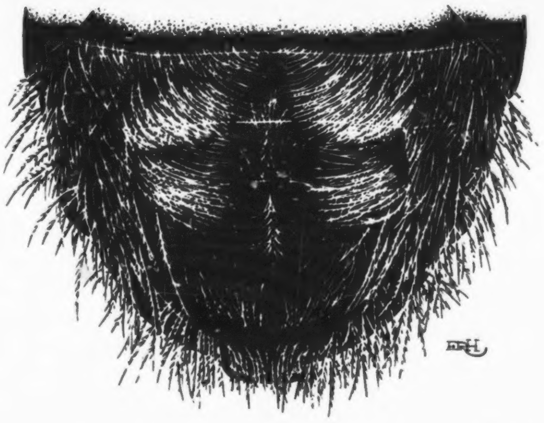


FIGURE 590.—*Lasioglossum pavonotum*, male sternal vestiture.

FLIGHT RECORDS (Figure 597).—*Lasioglossum pavonotum* females have been collected from February to early November, with records from California peaking in April, whereas those from Oregon and Washington peak in early June. Male records peak in August but range from early March through October.

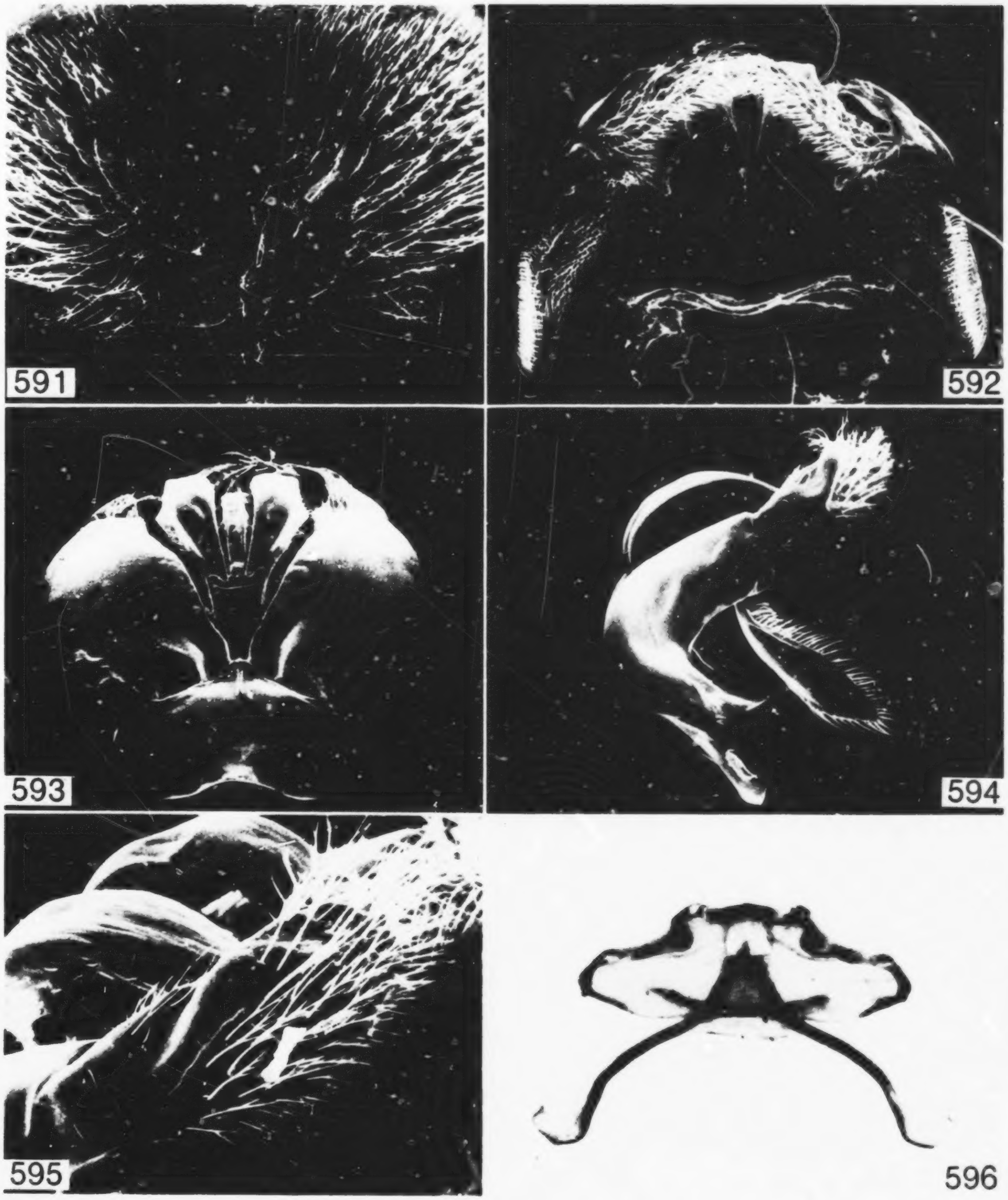
FLOWER RECORDS.—Females (65): Compositae 49%; Polygonaceae 18%; Leguminose 15%; Papaveraceae 9%. Males (21): Compositae 67%; Aizoaceae 14%; Hydrophyllaceae 14%. Total: 86 in six families, 13 genera as follows:

Achillea 2♀; **Agoseris* 5(3)♀; *Baccharis* 1♂; *Eriogonum* 12♀; **Escholtzia* 6(2)♀, 1♂; *Grindelia* 4♀, 13♂; **Hypochoeris* 4(3)♀; *Layia* 4♀; **Lupinus* 9(1)♀; *Malacothrix* 13 ♀; *Meliotus* 1♀; *Mesembryanthemum* 1♀, 3♂; *Phacelia* 4♀, 3♂.

MITE ASSOCIATES.—The acarinarium of female *L. pavonotum* is very weakly developed, represented only by a glabrous median area of the anterior surface of metasomal tergum I (Figure 591). Only 10.4% of the females and 5.3% males examined in this study carried mites.

SPECIMENS EXAMINED.—845 (619♀, 226♂).

UNITED STATES. CALIFORNIA: *Contra Costa Co.:* including Antioch; *Del Norte Co.:* Cresent City; *Humboldt Co.; Los Angeles Co.; Marin Co.; Mendocino Co.; Monterey Co.; Orange Co.:* Newport Beach; *San Francisco Co.; San Luis Obispo Co.; San Mateo Co.; Santa Clara Co.:* Saratoga; *Santa Cruz Co.:* Ano Nuevo State Beach, Davenport; *Santa Barbara*



FIGURES 591–596.—*Lasioglossum pavonotum:* 591, weakly developed acarinarium at base of female tergum I; 592, male genitalia, ventral view; 593, same, dorsal view; 594, same, lateral view; 595, male gonostylus; 596, male sterna VII–VIII.

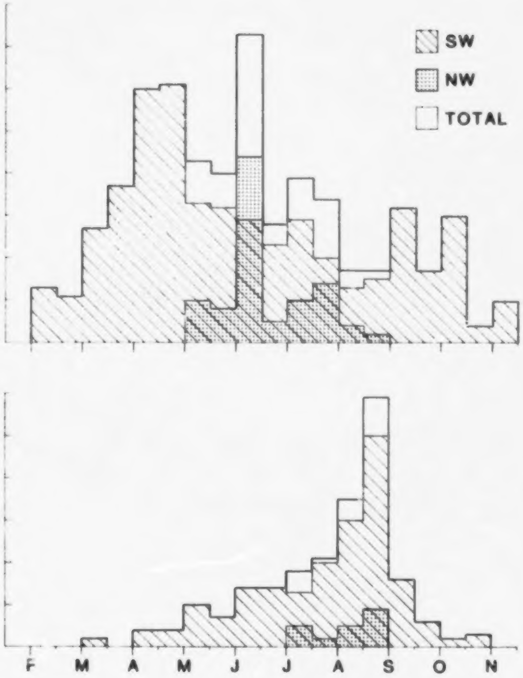


FIGURE 597.—*Lasioglossum pavonotum* flight records.

Co.: including San Miguel Island and Santa Rosa Island, *Sonoma Co.:* Bodega Bay, Dillon Beach, Stillwater Cove; *Ventura* Co.: Oxnard, Point Mugu Naval Air Station, Ventura. OREGON: *Coos Co.:* Bandon; *Curry Co.:* Gold Beach; *Lane Co.:* Florence, Westlake; *Lincoln Co.:* Newport, Pacific City, Waldport, Yachats; *Tillamook Co.:* Sand Lake, Tierra del Mar, 3 mi N. WASHINGTON: *Gray's Harbor Co.:* Copalis; *Pacific Co.:* Nahcotta, Ocean Park.

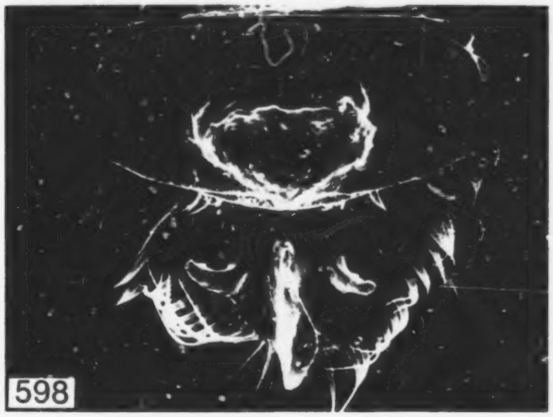
35. *Lasioglossum perscabrum*, new species

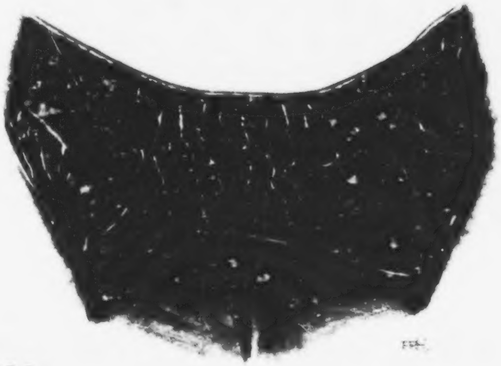
FIGURES 48, 300, 598, 599

TYPE MATERIAL.—The female holotype and two paratypes are deposited in the Snow Museum, University of Kansas. The holotype is labeled

MEXICO San Luis Potosi, 17 mi. E. Cd.[Ciudad del] Maiz, 3200 ′[feet] 23 July 1962 U.[niversity] Kans.[as] Mex.[ican] Exped.[ition]/LASIOGLOSSUM det.[ermined by] G.C. Eickwort/HOLOTYPE Lasioglossum perscabrum R.J. McGinley [red label].

The holotype is in excellent condition.

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FIGURES 598, 599.—*Lasioglossum perscabrum*, female: 598, labrum; 599, propodeum.

ETYMOLOGY.—The specific epithet is derived from the Latin *per* (very) plus *scabrum* (rough), a reference to the strongly reticulate dorsal propodeal surface (appearing scabrous through light microscope) that differentiates this species from all other known New World *Lasioglossum*.

DISTRIBUTION (Figure 300).—*Lasioglossum perscabrum* is known from only three females collected in 1954 and 1962 in the vicinity of Ciudad del Maiz, San Luis Potosi, Mexico.

DIAGNOSIS.—The entirely reticulate dorsal propodeal surface (Figure 599) will distinguish *L. perscabrum* from all other known Mexican *Lasioglossum* (the propodeal surface of *L. orphnaeum* is highly sculptured but is striate, not reticulate, Figure 547). Like *L. citerius* and *L. orphnaeum* and no other Mexican *Lasioglossum* species, the mesoscutal punctation is coarse, nearly contiguous and becomes scabrous anteriorly (similar to Figure 548) and the pronotal lateral angle is a sharply projecting right angle. *Lasioglossum perscabrum* can further be differentiated from *L. citerius* and *L. orphnaeum* in that the latter two species have dark brown mesoscutal hairs (at most light brown in *L. perscabrum*). Other characters helpful in recognizing *L. perscabrum*, also shared with *L. citerius* and *L. orphnaeum*, are the short head (similar to Figure 545) and the absence of a metasomal acarinarium.

DESCRIPTION.—FEMALE: (1) Length 8.4–8.9 mm ($\bar{x}$ = 8.6, n = 3); (2) wing length 2.2–2.4 mm ($\bar{x}$ = 2.3, n = 3); (3) abdominal width 2.9–3.0 mm ($\bar{x}$ = 2.9, n = 3).

Structure: (4) Head short (similar to Figure 548; length/width ratio 0.81–0.83, $\bar{x}$ = 0.82, n = 3). (7) Supraclypeal area evenly rounded, (8) moderately protuberant. (9) Clypeus projecting approximately 0.67 of its length below lower margin of eyes; (11) surface without median longitudinal sulcation. (14) Distance between lateral ocelli subequal to distance between lateral ocellus and eye. (23) Flagellomere 1 slightly shorter than 2 along dorsal surface. Labrum as in Figure 598; (27) distal keel moderately broad in frontal view, slightly widest basally; (28) distal lateral projections extremely well developed, conspicuously elongated and prong-like; (29) fimbrial setae acutely pointed.

(32) Pronotal lateral angle forming sharply projecting right angle; (33) pronotal lateral ridge nearly complete, obscurely interrupted by oblique lateral sulcus; (34) lower portion of lateral ridge inconspicuous, broadly rounded. (35) Mesoscutal lip very weakly bilobed, (36) moderately elevated from pronotum. (40) Dorsal surface of propodeum elongate, about 0.94 the length of scutellum and about 1.5 times the length of metanotum, (41) not depressed centrally, (42) posterior margin sharply truncated; (43) propodeal triangle well defined by circular carina; (44) lateral carinae encircling posterior surface, interrupted dorsally by V-shaped elevation. (45) Tibial spur as in Figure 48.

(46) Lateral edge of metasomal tergum II very weakly sinuate, nearly straight.

Sculpture: (47) Face shiny, (48) densely punctate below ocelli, punctures contiguous, becoming larger and less dense near antennae. (51) Supraclypeal area moderately granulate; (52) punctures separated by their width or less laterally, becoming impunctate centrally. (53) Clypeus granulate basally, apical two-thirds polished; (54) punctures separated by less than their width basally, less dense apically. (56) Meoscutum moderately shiny; (57) punctation as in Figure 548, punctures moderately coarse, dense and contiguous throughout, surface scabrous along anterior edge. (58) Scutellum nearly uniformly punctate, punctures at most separated by their width. (63) Dorsal surface of propodeum (Figure 599) strongly reticulate; (64) surface smooth, not alveolated. (65) Metasomal tergum I moderately shiny; (66) punctation fine, dense, punctures slightly less than their width apart.

Coloration: (71) Wing membrane pale yellowish brown.

Vestiture: (74) Pubescence of head white. (75) Pubescence of thorax mostly white to yellowish white, hairs on mesoscutum and scutellum brown; (76) mesoscutal hairs moderately dense and plumose. (77) Hind tibial hairs concolorous, brown. (78) Anterior hairs of metasomal tergum I white, (79) basal hair bands of terga II–IV yellowish white. (80) Acarinarium absent, elongate hairs scattered over anterior surface of tergum I.

SPECIMENS EXAMINED.—3♀.

MEXICO. SAN LUIS POTOSI: Ciudad del Maiz, 5 mi E, 22 Aug 1954, 4700 ft, Univ. Kansas Mex. Exped. (1♀; KU), 1 mi E, 23 Jul 1962, 3200 ft, Univ. Kansas Mex. Exped. (2♀, includes holotype; KU).

36. *Lasioglossum pharum* (Vachal)

FIGURES 49, 600–604

Halictus pharus Vachal, 1904:175 [female; compared to *Lasioglossum circinatum*].—Cockerell, 1905a:90 [key].

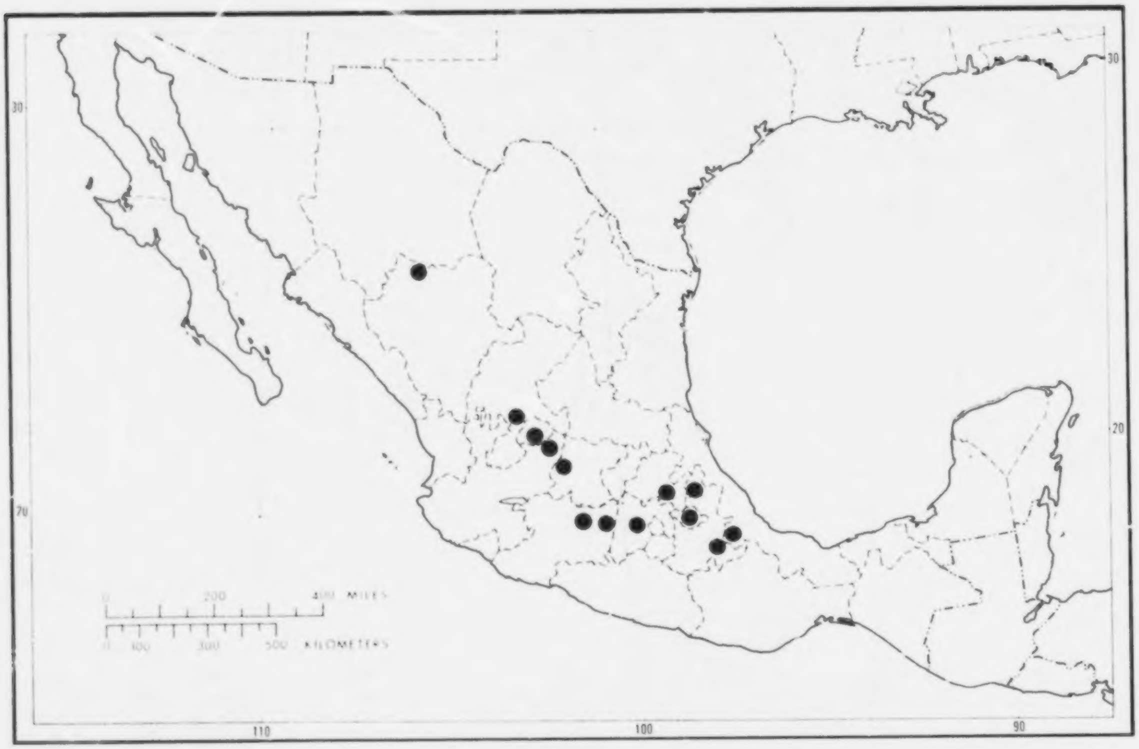


FIGURE 600.—Distribution of *Lasioglossum pharum*.

Lasioglossum pharum.—Moure and Hurd, 1986:63 [catalog].

TYPE MATERIAL.—The female holotype, in excellent condition, is in the Paris Museum (MNHNP) and is labeled

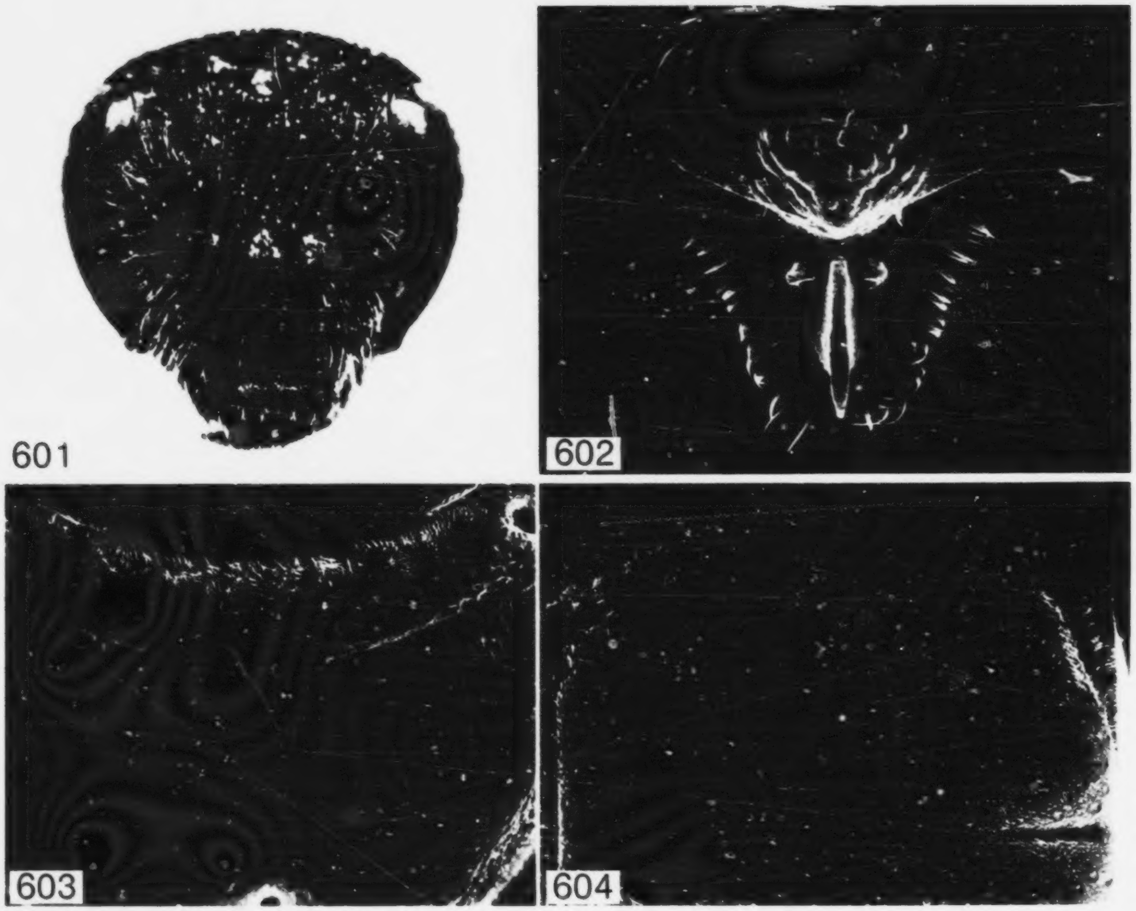
Museum Paris, Mexique, Sallé 1859/25, 59 [handwritten on circular label with green back]/Holotype [handwritten, red label]/pharus Vach.[al] ♀ [handwritten]/Halictus pharus Vach[al] [handwritten].

No paratypes were designated.

DISTRIBUTION (Figure 600).—*Lasioglossum pharum* is found at high elevations in central Mexico. Nearly all of the 52 known specimens are associated with elevation data that ranges from 5800–8800 feet.

DIAGNOSIS.—*Lasioglossum pharum* females can be recognized by their conspicuously doubly-punctate mesoscutum (Figure 604), smooth dorsal propodeal surface (Figure 603), elongate head (Figure 601, length/width ratio 0.90–0.97, $\bar{x}$ = 0.93), and lack of a metasomal acarinarium. The similar *L. circinatum* has a mesoscutum that is only obscurely doubly-punctate, appearing completely granuloso-punctate under the light microscope (Figure 335) and a dull, granulate clypeal surface (polished, shiny in *L. pharum*). The only other New World *Lasioglossum* having the above diagnostic character combination is *L. tropidonotum*, which is readily distinguished by its median longitudinal mesoscutal keel (Figure 174) and the adpressed, short pubescence that entirely covers metasomal terga IV–V. *Lasioglossum bajaense* and *L. uyacicola* are superficially similar to *L. pharum* but both have metasomal acarinaria. The male of *L. pharum* is not known.

DESCRIPTION.—FEMALE: (1) Length 9.2–10.3 mm ($\bar{x}$ = 9.7, n = 9); (2) wing length 2.6–3.1 mm ($\bar{x}$ = 2.9, n = 9); (3) abdominal width 3.2–3.5 mm ($\bar{x}$ = 3.3, n = 9).



FIGURES 601–604.—*Lasioglossum pharum*, female: 601, head; 602, labrum; 603, propodeum; 604, mesoscutum.

Structure: (4) Head elongate (Figure 601; length/width ratio 0.90–0.97, x̄ = 0.93, n = 9). (7) Supraclypeal area evenly rounded, (8) moderately protuberant. (9) Clypeus projecting approximately 0.80 of its length below lower margin of eyes; (11) surface without median longitudinal sulcation. (14) Distance between lateral ocelli slightly exceeded by distance between lateral ocellus and eye. (23) Flagellomere 1 subequal to 2 in length along dorsal surface. Labrum as in Figure 602; (27) distal keel moderately narrow, nearly parallel-sided; (28) distal lateral-projections small, somewhat conical; (28) most fimbrial setae bluntly rounded apically.

(32) Pronotal lateral angle narrowly obtuse; (33) pronotal lateral ridge incomplete, conspicuously interrupted by well-developed oblique lateral sulcus; (34) lower portion of lateral ridge sharply edged near oblique sulcus, becoming rounded ventrally. (35) Mesoscutal lip very weakly bilobed, (36) moderately elevated from pronotum. (40) Dorsal surface of propodeum about 0.67 the length of scutellum and about 1.3 times the length of metanotum, (41) not depressed centrally, (42) posterior margin broadly rounded; (43) propodeal triangle not defined except for inconspicuous median V-shaped elevation without lateral rims; (44) lateral carinae

extending about two-thirds the length of posterior surface. (45) Tibial spur as in Figure 49.

(46) Lateral edge of metasomal tergum II very weakly sinuate, nearly straight.

Sculpture: (47) Face dull, granulate, (48) doubly-punctate, smaller punctures dense, separated by less than their width, larger punctures separated by 1–2 times their width. (51) Supraclypeal area obscurely granulate, moderately polished centrally; (52) punctures separated by their width or less laterally, becoming impunctate centrally. (53) Clypeus mostly polished, basal one-third very obscurely granulate; (54) punctures separated by less than their width basally, separated by their width on apical one-third. (56) Mesoscutum moderately dull; (57) punctation as in Figure 604, conspicuously doubly-punctate, smaller punctures separated by less than their width, becoming slightly less dense centrally, larger punctures separated by 3–5 times their width. (58) Scutellar punctation very sparse, obscurely doubly-punctate, smaller punctures separated by 2–3 times their width adjacent to median line, larger punctures scattered. (63) Dorsal surface of propodeum (Figure 603) nearly entirely smooth, weakly striolate laterally with very weak median striae confined to basal one-third; (64) surface extensively alveolated. (65) Metasomal tergum I moderately shiny; (66) punctation fine, dense, punctures slightly less than their width apart.

Coloration: (71) Wing membrane hyaline.

Vestiture: (72) Unlike most species, hairs between vertex and antennae conspicuously simple, weakly recurved, contrasting with plumose hairs near antennae; (73) pubescence of head white. (75) Pubescence of thorax white; (76) mesoscutal hairs moderately dense and plumose. (77) Hind tibial hair color differentiated, hairs mostly white, dorsal hairs dark brown basally, becoming very light brown at midpoint of tibia. (78) Anterior hairs of metasomal tergum I and (79) basal hair bands of terga II–IV white. (80) Acarinarium absent, elongate hairs scattered over anterior surface of tergum I.

FLIGHT RECORDS.—Most *L. pharum* females have been collected in August, but records range from late June through September and two more from December.

FLOWER RECORDS.—*Ipomea* 1♀; *Ludwigia* 1♀; *Penstemon* 1♀.

SPECIMENS EXAMINED.—51♀.

MEXICO. AGUASCALIENTE: Aguascaliente, 1 Dec 1909, F.C. Bishopp (1♀; USNM). DURANGO: Encino, 27 Jul 1947, 6200 ft, Gertsch (1♀; AMNH). GUANAJUATO: Leon, 13 mi SE, 19 Jul 1954, 6000 ft, C.D. Michener & party (4♀; KU). HIDALGO: Baranca de San Vicente, 9 Aug 1957, 7000 ft, R.M. Straw, D.P. Gregory (1♀; OrS); Pachuca, 25 Aug 1962, 8750 ft, Ordway & Marston (3♀; KU); Tizayuca, 13.5 mi NE, 28 Aug 1962, 7700 ft, Univ. Kansas Mex. Exped. (1♀; KU); Tulancingo, 4–6 mi E, 24 Aug 1962, 6900–7100 ft, Ordway, Roberts, Marston (22♀; KU), 7 mi S, 26 Aug 1962, 7500 ft, Naumann & Roberts (1♀; KU). JALISCO: Lagos de Moreno, 5.6 mi NE, 27 Jul 1962, 5800 ft, Univ. Kansas Mex. Exped. (1♀; KU). MEXICO: Toluca, 4 mi E, 17 Aug 1951, 8400 ft, Univ. Kansas Mex. Exped. (3♀; KU), 22 mi N, 17 Aug 1954, 8800 ft, J.G. Chillcott (1♀; CNC); Villa, 7 km E, 14 Jul 1965, H.E. Evans (1♀; MCZ). MICHOACAN: Morelia, 10 mi N, 28 Jul 1962, 5900 ft, Univ. Kansas Mex. Exped. (2♀;KU); Patzcuaro Lake, 21 Sep 1957, 6800 ft, H.A. Scullen (1♀; OrS); Zitacuaro, 11 mi NW, 30 Jul 1962, Univ. Kansas Mex. Exped. (1♀; KU). PUEBLA: Huauchinango, 17 Jun 1951, P.D. Hurd (1♀; UCB), 8 mi W, 23 Aug 1962, 6450 ft, Univ. Kansas Mex. Exped. (1♀; KU); Tehuacan, 40 mi E, 27 Jul 1964, H.V. Daly (2♀; CAS). TLAXCALA: Apizaco, 8 mi WNW, 18 Jun 1961, 8200 ft, Univ. Kansas Mex. Exped. (1♀; KU). VERACRUZ: Orizaba, 10 mi W, 31 Dec 1940, G.E. Bohart (1♀; CAS). ZACATECAS: Villa Nueva, 21 mi S, 12 Sep 1966, D. Breedlove (1♀; CU).

37. *Lasioglossum rupticristum*, new species

FIGURES 50, 485, 605

TYPE MATERIAL.—The female holotype of *L. rupticristum* is deposited in the Cornell University Collection. The specimen is in excellent condition and is labeled

ARIZ.[ona] Cochise Co. Chiricahua Mts. Onion Saddle, 7600′ 12 Aug. 1972 G. & K. Eickwort/HOLOTYPE Lasioglossum rupticristum R.J. McGinley.

Twenty female paratypes listed in the "Specimens Examined" section are designated.

ETYMOLOGY.—The species epithet comes from the Latin *ruptura* (fracture, break) plus *crista* (ridge) and alludes to the broken pronotal lateral carina, which differentiates this species from the very similar *L. heterorhinum* and *L. lampronotum,* which have a complete carina.

Distribution (Figure 485).—*Lasioglossum rupticristum* is known from only 21 females that have been collected from Arizona, Colorado, and New Mexico.

Diagnosis.—The short head (similar to Figure 458), granuloso-punctate anterior third of the mesoscutum (as in Figure 463), and absence of an acarinarium will distinguish *L. rupticristum* from all other New World *Lasioglossum* except *L. heterorhinum*. The pronotal lateral carina of the latter species is complete, whereas that of *L. rupticristum* is interrupted by an oblique lateral sulcus. *Lasioglossum lampronotum* is also similar to *L. rupticristum* but has a shiny mesoscutum with distinct anterior punctures and a complete pronotal lateral carina. Most specimens of *L. rupticristum* (including the holotype) are unusual in having yellowish orange pubescence (as opposed to white or yellowish brown) and faint metallic tints on the mesoscutum (not visible in all specimens). See *L. heterorhinum* "Diagnosis" for further details.

Description.—female: (1) Length 8.0–8.8 mm ($\bar{x} = 8.3$, $n = 15$); (2) wing length 2.3–2.5 mm ($\bar{x} = 2.4$, $n = 15$); (3) abdominal width 2.4–3.0 mm ($\bar{x} = 2.8$, $n = 15$).

Structure: (4) Head short (similar to Figure 458; length/width ratio 0.83–0.92, $\bar{x} = 0.87$, $n = 15$). (7) Supraclypeal area evenly rounded, (8) weakly protuberant. (9) Clypeus projecting approximately 0.65 of its length below lower margin of eyes; (11) surface with obscure median longitudinal sulcation. (14) Distance between lateral ocelli subequal to distance between lateral ocellus and eye. (23) Flagellomere 1 slightly shorter than 2 along dorsal surface. Labrum as in Figure 605; (27) distal keel broad in frontal view, spoon-shaped; (28) distal lateral projections somewhat weakly developed, rounded; (29) fimbrial setae acutely pointed.

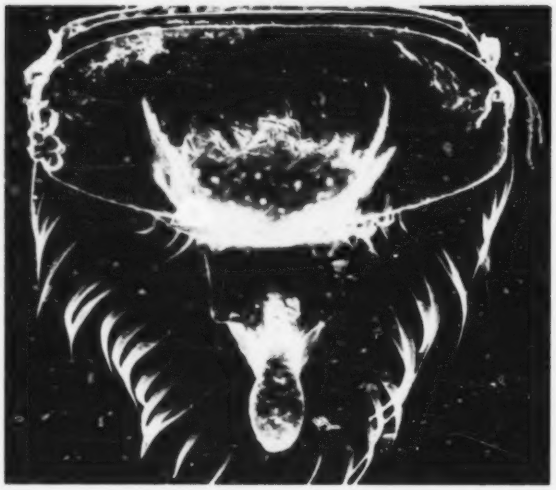


Figure 605.—*Lasioglossum rupticristum*, female labrum.

(32) Pronotal lateral angle broadly obtuse; (33) pronotal lateral ridge incomplete, interrupted by oblique lateral sulcus; (34) lower portion of lateral ridge narrowly rounded. (35) Mesoscutal lip weakly bilobed, (36) moderately elevated from pronotum. (40) Dorsal surface of propodeum about 0.81 the length of scutellum and about 1.2 times the length of metanotum, (41) slightly depressed centrally, (42) posterior margin broadly rounded; (43) propodeal triangle weakly defined, evident medially as a very low V-shaped elevation with inconspicuous lateral rims, fading towards metanotum; (44) lateral carinae extending at most to midpoint of posterior surface. (45) Tibial spur as in Figure 50.

(46) Lateral edge of metasomal tergum II weakly sinuate.

Sculpture: (47) Face shiny, (48) densely and uniformly punctate between ocelli and antennae, punctures contiguous. (51) Supraclypeal area extremely granulate; (52) punctures separated by their width laterally, becoming sparse centrally, punctures separated by 3–4 times their width. (53) Clypeus mostly polished, obscurely granulate along basal edge; (54) punctation nearly uniform, punctures separated by their width or slightly less. (56) Mesoscutum shiny; (57) punctation as in Figure 463, punctures contiguous laterally, becoming granuloso-punctate anteriorly, less dense centrally, punctures separated by 1–2 times their width. (58) Scutellum sparsely punctate adjacent to median line, punctures 2–3 times their width apart. (63) Dorsal surface of propodeum rugulose (similar to Figure 462); (64) surface obscurely alveolated. (65) Metasomal tergum I moderately shiny; (66) punctation fine, extremely dense, punctures nearly contiguous.

Coloration: (71) Wing membrane hyaline.

Vestiture: (74) Pubescence of head white. (75) Pubescence of thorax white; (76) mesoscutal hairs moderately dense and plumose. (77) Hind tibial hairs concolorous, very pale yellowish brown. (78) Anterior hairs of metasomal tergum I and (79) basal hair bands of terga II–IV white. (80) Acarinarium absent, elongate hairs scattered over anterior surface of tergum I.

FLIGHT RECORDS.—*Lasioglossum rupticristum* females have been collected from early May through October.

FLOWER RECORDS.—One female taken from *Cirsium*, and one from *Heliopsis* (both records from the Chiricahua Mountains, Cochise County, Arizona.

REMARKS.—Fourteen males from Arizona that may be conspecific with *L. rupticristum* females have been labeled

Lasioglossum sp. nr [near] desertum (male rupticristum ?) det. R.J. McGinley.

They are housed in the following collections: AMNH, CAS, CU, LACM, OrS, UAT. Their heads appear to be slightly longer than those of *L. desertum* and the hair fringe at the posterior edge of sternum V is much more conspicuous (similar to that of *L. argutum*, Figure 268). Because of the extreme uncertainty of this association these specimens are not formally treated here.

SPECIMENS EXAMINED.—21♀.

UNITED STATES. ARIZONA: *Cochise Co.:* Chiricahua Mountains, 28 Sep 1960, 8000 ft, G.E. Bohart (1♀; USU); Portal, 9 mi W, 3 Jun 1959, L.A. Stange (1♀; UCD); Onion Saddle (Chiricahua Mts.), 12 Aug 1972, 7600 ft, G. & K. Eickwort (2♀, includes holotype; CU); Rustler Park (Chiricahua Mts.), 26 Aug 1958, P.D. Hurd (1♀; UCB), 23–26 Aug 1959, 8500 ft, H.E. Evans, E.G. Linsley (2♀; UCB, CU), 14 May 1972, C.W. O'Brien (1♀; FSCA). *Coconino Co.:* Flagstaff, 20 mi SW, 18 Sep 1966, R.S. Beal (1♀; NAU). *Navajo Co.:* unspecified locality, 21 Jun 1957, G. Butler, F. Werner (1♀; UAT). *Pima Co.:* Santa Catalina Mountains, 14 Aug 1952, G. Bohart, G. Butler (1♀; USU), 25 Jul 1954, G. Butler (1♀; UAT), 14–25 Aug 1954, G. Bohart, G. Butler (3♀; UAT), 9 Oct 1954, G. Butler (1♀; UAT), 18 Jul 1955, G.D. Butler, F.G. Werner (1♀; UAT). COLORADO: *Custer Co.:* Florence, 36 mi S (Davenport Camp), 29 Jun 1967, 8500 ft, F., P. & M. Rindge (3♀; AMNH). NEW MEXICO: *Colfax Co.:* unspecified locality, 21 Aug 1927, R.H. Beamer (1♀; KU).

38. *Lasioglossum sandrae*, new species

FIGURES 51, 395, 606

TYPE MATERIAL.—The holotype female is the property of the California Insect Survey, University of California, Berkeley, but is on loan deposit to the California Academy of Sciences, San Francisco. The specimen in excellent condition and is labeled

10.2 mi. W. Pueb.[la]-Ver.[acruz] boundary, Hwy [highway] 150, Pueb.[la] Mexico VII [Jul]-5, 1962/D.H. Janzen Collector/[green unlabeled paper point]/n.g. [new genus] det. G.C. Eickwort/HOLOTYPE Lasioglossum sandrae R.J. McGinley [red label].

The two female paratypes are in the collections of Cornell University and the University of California, Berkeley.

ETYMOLOGY.—This species is named in honor of Sandra Shanks (formerly of the Smithsonian Institution), who provided invaluable technical assistance and thoughtful discussion throughout the course of this project.

DISTRIBUTION (Figure 395).—*Lasioglossum sandrae* is known from only three females collected in the vicinity of Tehuacan in the Mexican state of Puebla.

DIAGNOSIS.—Females of *L. sandrae* can immediately be recognized by the short, adpressed, pale pubescence that entirely covers the mesoscutal disc. See the *L. eickworti* diagnosis for further details.

DESCRIPTION.—FEMALE: (1) Length 9.8–11.1 mm ($\bar{x} = 10.4$, $n = 3$); (2) wing length 3.0–3.2 mm ($\bar{x} = 3.1$, $n = 3$); (3) abdominal width 3.2–3.4 mm ($\bar{x} = 3.3$, $n = 3$).

Structure: (4) Head moderately short (similar to Figure 396; length/width ratio 0.90–0.98, $\bar{x} = 0.93$, n = 3). (7) Supraclypeal area evenly rounded ventrally, somewhat narrowly rounded dorsally near well-developed frontal carina, (8) area protuberant. (9) Clypeus projecting approximately 0.75 of its length below lower margin of eyes; (11) surface without median longitudinal sulcation, broadly rounded dorsally but, unlike other species, with distinct semicircular depressed area along ventral edge. (14) Distance between lateral ocelli exceeded by distance between lateral ocellus and eye. (23) Flagellomere 1 slightly shorter than 2 along dorsal surface. Labrum as in Figure 606; (27) distal keel broad in frontal view, somewhat spoon-shaped; (28) distal lateral projections well developed, triangular; (29) fimbrial setae acutely pointed.

(32) Pronotal lateral angle forming sharply pointed right angle; (33) pronotal lateral ridge incomplete, very narrowly interrupted by oblique lateral sulcus; (34) upper portion of lateral ridge strongly carinate, lower portion narrowly rounded. (35) Mesoscutal lip very weakly bilobed, (36) moderately elevated from pronotum. (40) Dorsal surface of propodeum about 0.68 the length of scutellum and about 1.3 times the length of metanotum, (41) not depressed centrally, (42) posterior margin rounded; (43) propodeal triangle moderately well defined by low median V-shaped elevation and sharp-edged lateral rims, fading towards metanotum; (44) lateral carinae extending approximately two-thirds the length of posterior surface. (45) Tibial spur as in Figure 51.

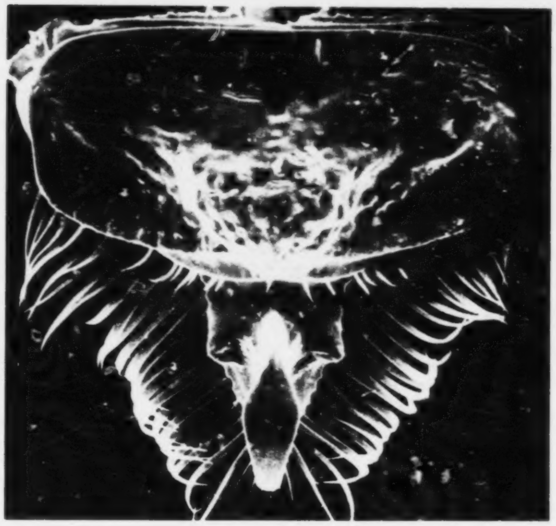


FIGURE 606.—*Lasioglossum sandrae*, female labrum.

(46) Lateral edge of metasomal tergum II broadly convex anteriorly, straight posteriorly (similar to that of *L. eickworti*).

Sculpture: (47) Face shiny, (48) densely and uniformly punctate between ocelli and antennae, punctures contiguous. (51) Supraclypeal area extremely granulate; (52) punctures separated by 1–2 times their width laterally, becoming impunctate centrally. (53) Clypeus mostly polished, granulate along basal edge; (54) punctures obscure, separated by 2–3 times their width. (56) Mesoscutum moderately shiny; (57) punctures fine, extremely dense and contiguous throughout. (58) Scutellum uniformly punctate, punctures fine, nearly contiguous. (63) Dorsal surface of propodeum striolate laterally, basal half of median area ruguloso-striolate, posterior half smooth with obscure striae; (64) surface alveolated. (65) Metasomal tergum I moderately dull; (66) punctation fine, extremely dense, punctures nearly contiguous over most of dorsal surface, posterior rim granuloso-punctate.

Coloration: (71) Posterior two-thirds of wing membrane mostly hyaline, anterior one-third infuscated.

Vestiture: (74) Pubescence of head mostly pale yellowish brown, brown near antennae; unlike other species, hairs on vertex and gena very short, dense, somewhat adpressed. (75) Pubescence of thorax pale yellowish brown to dark brown; (76) unlike other species, mesoscutal and scutellar hairs very short, dense, adpressed, obscuring surface. (77) Hind tibial hairs virtually concolorous, dark brown with small apical patch of white hairs on dorsal surface. (78) Anterior hairs of metasomal tergum I yellowish brown, (79) basal hair bands of terga II–IV yellowish white to pale yellowish brown. (80) Acarinarium absent, anterior surface of tergum I with short, adpressed hairs (less conspicuous than those of *L. eickworti*) surrounded laterally by elongate hairs. (81) Unlike most species, basal hair bands of terga II–III weakly defined with short, adpressed hairs covering most of tergal surface; terga IV–V entirely covered by adpressed hairs.

Flight Records.—One female was collected in late June, the other two were taken in early July.

Remarks.—*L. sandrae*, *L. eickworti*, and *L. katyae* probably comprise a natural group that possibly deserves subgeneric ranking. See "Remarks" section for *L. eickworti*.

Specimens Examined.—3♀.

MEXICO. Puebla: Puebla-Veracruz boundary, 10.2 mi W (Highway 150), 5 Jul 1962, D.H. Janzen (2♀, includes holotype; CAS, UCB). Tehuacan, 23 Jun 1951, H.E. Evans (1♀; CU).

39. *Lasioglossum sisymbrii* (Cockerell)

Figures 52, 132, 607–618

Halictus sisymbrii Cockerell, 1895:63 [female]; 1897:168 [male]; 1898a:46 [key]; 1898c:50 [key].—Crawford, 1906:297, 299, 300 [key, locality records].—Cockerell, 1906:294 [locality records]; 1907:241 [key]; 1908:119 [locality, floral records]; 1941:344 [locality and floral records, taxonomic notes].

Halictus sisimbrii.—Cockerell, 1897:165 [lapsus calami].

Halictus olympyiae var. *subangustus* Cockerell, 1898b:51. [New synonymy.]

Halictus olympiae var. *subangustatus.*—Crawford, 1906:301 [error for *subangustus*].

Lasioglossum olympiae var. *subangustus.*—Michener, 1951:1107 [Nearctic catalog; emendation].—Hurd, 1979:1957 [Nearctic catalog].

Lasioglossum sisymbrii.—Michener, 1951:1107 [Nearctic catalog].—Linsley, 1962:159 [sleeping behavior.]—Linsley et al., 1963:18 [floral, locality records].—Moldenke and Neff, 1974:55 [locality and flower records].—Alcock and Gamboa, 1975:163 [predator].—Hurd and Linsley, 1975:28, tables 2, 9, 11, 13 [floral records].—Kumar et al., 1976:48 [locality record].—Stockhouse and Wells, 1978:127 [floral records].—Hurd, 1979:1958 [Nearctic catalog].—Hurd et al., 1980:27, 66.—Evans, 1982:573 [predator, *Philanthus barbatus* Smith].

Type Material.—The female lectotype, herein designated, is labeled

Ckll [Cockerell] 2752 on Sisymbrium [handwritten by Cockerell]/Type No. 3390 U.S.N.M. [red label]/H.[alictus] sisymbrii n. sp. [handwritten by Cockerell]/LECTOTYPE Halictus sisymbrii Cockerell des.[ignated by] McGinley [red label].

Cockerell's only reference to the type series in the original description is

Hab.[itat] College Farm, Las Cruces, N.M., April 16 1895; one swept from Sisymbrium canescens (Ckll. 2572).

The difference in Cockerell's numbers (2752 and 2572) is here taken to be the result of a typographical error. The one known paralectotype is labeled

Las Cruces NM [New Mexico]/Ckll. [Cockerell] 2878 on Melilotus [handwritten by Cockerell]/CoType No. 3390 U.S.N.M. [red label]/H.[alictus] sisymbrii [handwritten by Cockerell]/PARALECTOTYPE Halictus sisymbrii Cockerell des.[ignated by] McGinley [yellow label].

The lectotype has the basal hair band of metasomal tergum I nearly worn off and the paralectotype is missing the middle right leg, otherwise both are in excellent condition. They are in the National Museum of Natural History, Smithsonian Institution.

The female holotype of *Halictus olympyiae* var. *subangustus* is in the National Museum of Natural History, Smithsonian Institution, and is labeled

Olympia, Wash.[ington]/♀ Type No. 12037 U.S.N.M. [red label]/H.[alictus] olympiae v.[ariety] subangustus Ckll. [Cockerell] TYPE. [handwritten by Cockerell].

The specimen is missing the last nine flagellomeres of the left antenna, and the basal hair band of metasomal tergum I is very worn, with only the lateral edges remaining. The worn hair band undoubtedly was the reason why Cockerell misidentified this specimen and thought it related to *Lasioglossum olympiae*. The original description of *H. subangustus* unfortunately included the typographical error of *olympyiae* for *olympiae*.

Distribution (Figure 607).—*Lasioglossum sisymbrii* is the most common and most widespread *Lasioglossum* species west of the 100th meridian. It is found from southern Canada south to central Mexico (20° north latitude) and has been

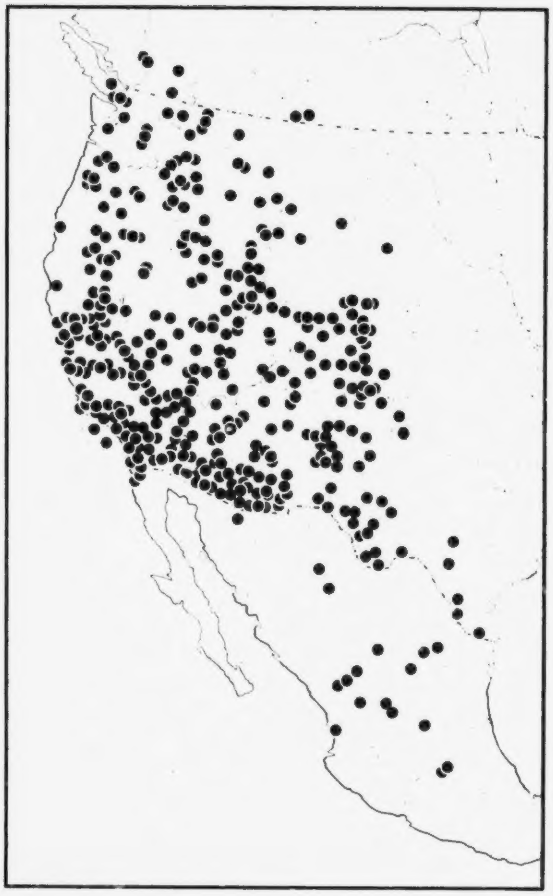


FIGURE 607.—Distribution of *Lasioglossum sisymbrii.*

collected in all western, southwestern, and Rocky Mountain states. Two females were collected as far east as Baton Rouge, Louisiana sometime in the late 1800s (specimens labeled "Through C.V. Riley" in the National Museum of Natural History, Smithsonian Institution). Recent easternmost records are from central and southern Texas.

DIAGNOSIS.—The presence of a complete basal hair band on metasomal tergum I (Figure 132) will distinguish both sexes of ***Lasioglossum sisymbrii*** from all other New World ***Lasioglossum*** species. ***Lasioglossum pavonotum*** has widely interrupted, inconspicuous basal hair patches on tergum I but is a highly distinctive metallic greenish blue bee, which cannot be confused with *L. sisymbrii.* The unique pale, translucent tegulae will identify the few *L. sisymbrii* specimens in which the basal hair band on tergum I has been worn or matted.

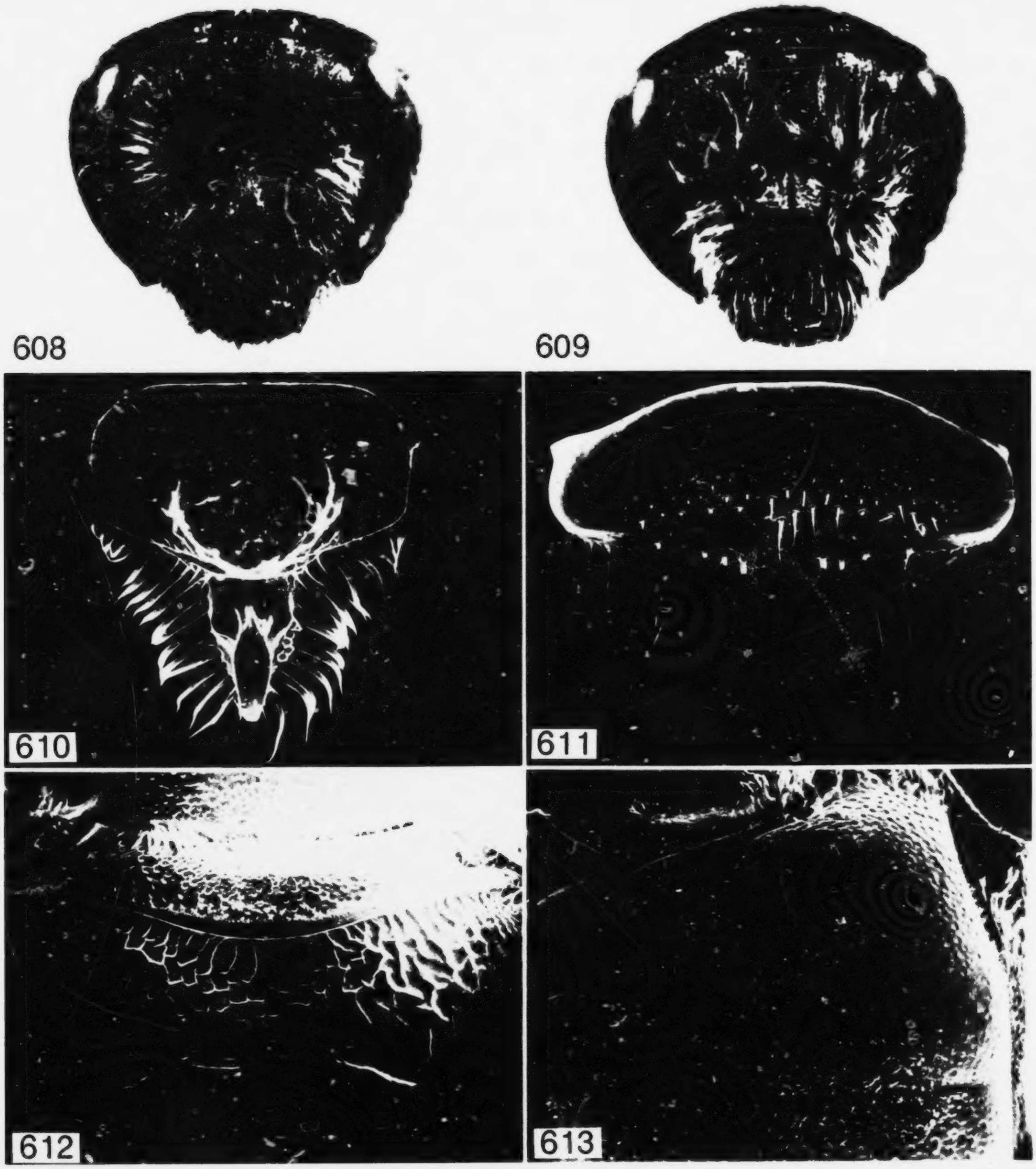
DESCRIPTION.—FEMALE: (1) Length 7.9–9.4 mm ($\bar{x}$ = 8.5, n = 15); (2) wing length 2.2–2.5 mm ($\bar{x}$ = 2.3, n = 15); (3) abdominal width 2.5–3.2 mm ($\bar{x}$ = 2.8, n = 15).

Structure: (4) Head moderately short (Figure 608; length/width ratio 0.79–0.96, $\bar{x}$ = 0.86, n = 15). (7) Supraclypeal area evenly rounded, (8) moderately protuberant. (9) Clypeus projecting approximately 0.75 of its length below lower margin of eyes; (11) surface without median longitudinal sulcation. (14) Distance between lateral ocelli slightly exceeding distance between lateral ocellus and eye. (23) Flagellomere 1 subequal in length to 2 along dorsal surface. Labrum as in Figure 610; (27) distal keel broad in frontal view, slightly spoon-shaped; (28) distal lateral projections very weakly developed, broadly rounded; (29) fimbrial setae acutely pointed.

(32) Pronotal lateral angle broadly obtuse; (33) pronotal lateral ridge incomplete, interrupted by oblique lateral sulcus; (34) lower portion of lateral ridge inconspicuous, broadly rounded. (35) Mesoscutal lip rounded, not bilobed, (36) moderately elevated from pronotum. (40) Dorsal surface of propodeum about 0.75 the length of scutellum and about 1.4 times the length of metanotum, (41) not depressed centrally, (42) posterior margin nearly truncate (bowing slightly posteriad); (43) propodeal triangle weakly defined laterally; (44) lateral carinae completely encircling posterior surface. (45) Tibial spur as in Figure 52.

(46) Lateral edge of metasomal tergum II weakly sinuate.

Sculpture: (47) Face shiny, (48) densely punctate below ocelli, punctures contiguous, becoming larger and less dense near antennae. (51) Supraclypeal area moderately granulate; (52) punctures separated by their width laterally, becoming only slightly less dense centrally. (53)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FIGURES 608–613.—*Lasioglossum sisymbrii:* 608, female head; 609 male head; 610, female labrum; 611, male labrum; 612, female propodeum; 613, female mesoscutum.

Clypeus obscurely granulate basally and medially to apex, highly polished apicolaterally; (54) punctures separated by less than their width basally and medially, apicolateral areas impunctate. (56) Mesoscutum shiny; (57) punctation as in Figure 613, punctation nearly uniform, dense, punctures separated by their width or less, slightly less dense centrally. (58) Scutellum nearly uniformly punctate, punctures slightly less dense adjacent to median line, separated by 1–2 times their width. (63) Dorsal surface of propodeum (Figure 612) strongly and completely striate with obscure transverse rugae to strongly reticulate; (64) surface smooth, not alveolated. (65) Metasomal tergum I shiny; (66) punctation fine, moderately dense, punctures separated by their width or slightly less.

Coloration: (70) Unlike other species, tegulae pale yellowish to translucent. (71) Wing membrane hyaline.

Vestiture: (74) Pubescence of head white. (75) Pubescence of thorax mostly white, yellowish white along edges of mesoscutum and on scutellum and metanotum; (76) mesoscutal hairs moderately dense, conspicuously plumose; as in *L. timberlakei*, mesoscutal hairs along lateroposterior edge short, adpressed (adpressed hairs also along anterior edge). (77) Hind tibial hairs nearly concolorous, most hairs white, narrow band of dorsal hairs very light brown. (78) Anterior hairs of metasomal tergum I and (79) basal hair bands of terga II–IV white. (80) Acarinarium absent, elongate hairs scattered over anterior surface of tergum I. (81) Unlike other species, tergum I with complete basal hair band, narrowed medially.

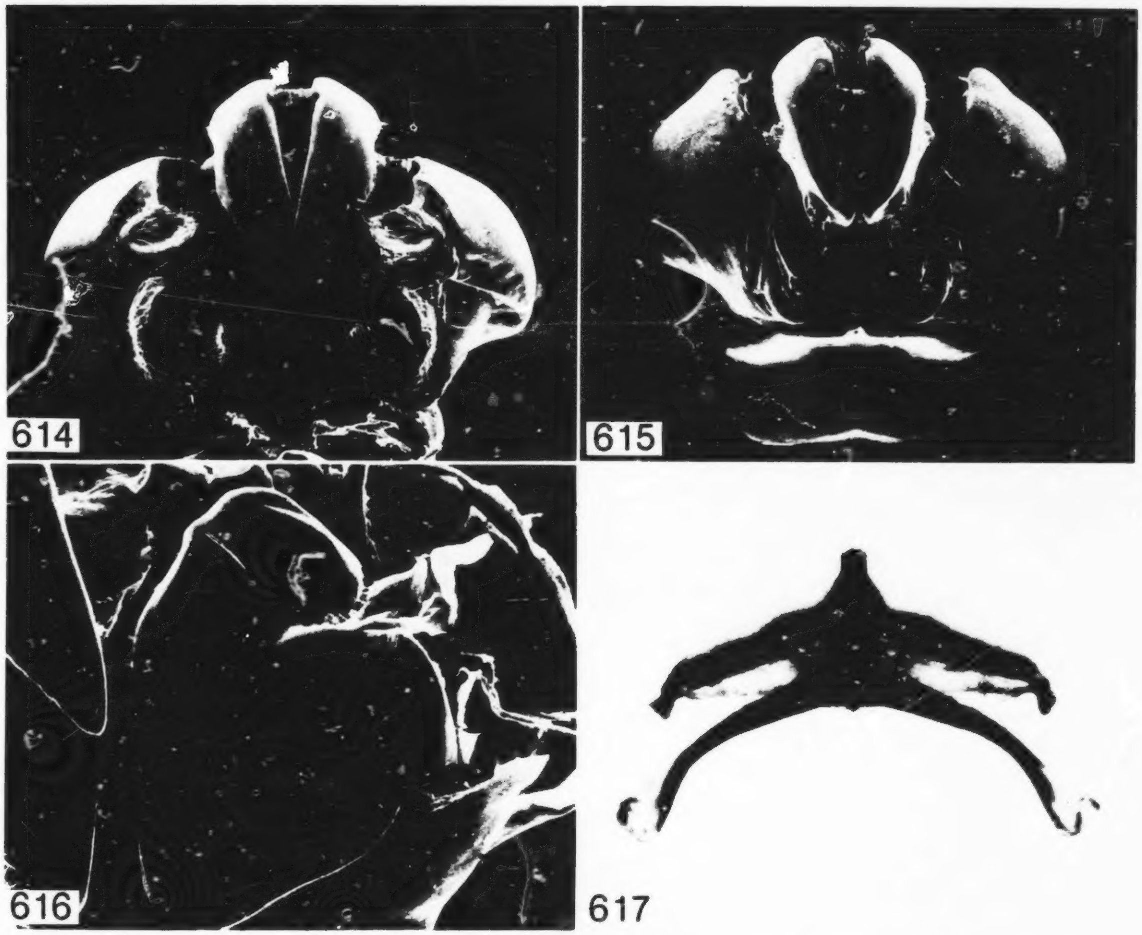
MALE: Similar to female except as follows: (1) length 6.9–9.1 mm ($\bar{x}$ = 7.5, n = 15); (2) wing length 1.9–2.4 mm ($\bar{x}$ = 2.1, n = 15); (3) abdominal width 2.0–2.5 mm ($\bar{x}$ = 2.2, n = 15). (4) Head as in Figure 609 (length/width ratio 0.81–0.91, $\bar{x}$ = 0.86, n = 15). (5) Gena subequal to eye in width, (6) rounded, not produced posteriorly. (10) Clypeal surface rounded, not depressed or flattened. (23) Unlike other species, length of flagellomere 1 less than half the length of flagellomere 2 (ratio 1:2 approximately 0.45). Labrum as in Figure 611; (24) distal process virtually absent; (25) basal area rounded medially, not depressed; (26) basal lateral depressions absent. (30) Mandible very short, not reaching opposing clypeal angle. (53) Clypeus weakly granulate, shiny; (54) punctation nearly uniform throughout, punctures separated by 1–2 times their width. (68) Clypeal maculation absent. (69) Flagellum entirely dark. (72) Tarsi dark, concolorous with tibiae.

Vestiture: (82) Hairs on sternum IV short, suberect, without noticeable pattern; (83) posterior edge of sternum V with well-developed hair fringe, hairs becoming longer laterally, forming elongate lateral hair tufts similar to those of *L. pacificum* (Figure 561; hair fringe margin not so rounded as that of *L. pacificum*).

Terminalia: Sterna VII–VIII as in Figure 617; (85) median process of sternum VIII virtually absent, extremely short, rounded. Genitalia as in Figures 614–616; (86) gonobase moderately elongate; (87) gonostylus short, robust, narrowly rounded apically; (89) retrorse membranous lobe slightly reduced, very slender basally, gradually broadening to rounded apex; (90) volsella with moderately protruding flange but lacking prominent rounded lobe.

FLIGHT RECORDS (Figure 618).—Females of *L. sisymbrii* have been collected in every month from January through November (the January, October, and November records are all from Arizona and California). In the southwestern region females have been commonly collected in late March–early April and then again in late June–early July. Females in the northwestern region have been commonly collected only in June. Males have been collected from late March through November, with a definite peak in early July.

FLOWER RECORDS.—Label data strongly suggest that *Lasioglossum sisymbrii* is broadly polylectic. Hurd, LaBerge, and Linsley (1980) reported this species as being a "casual polylege" of *Helianthus*. Females have been collected from the flowers of Compositae, Cruciferae, and Leguminosae



FIGURES 614–617.—*Lasioglossum sisymbrii*, male: 614, genitalia, ventral view; 615, same, dorsal view; 616, volsella; 617, sterna VII–VIII.

in nearly equal proportions. Females with pollen loads have been taken from the flowers of 25 families. This is not meant to imply that all 25 families were actual pollen sources; however, this high number of families is suggestive of polylecty.

Summary: Females (953): Compositae 17%; Cruciferae 16%; Leguminosae 15%; Salicaceae 9%. Males (212): Compositae 43%; Leguminosae 23%. Total: 1165 in 49 families, 151 genera as follows:

Achillea 1♀, 3♂; **Actinea* 3(2)♀, 2♂; *Adenostemma* 2♀; *Agave* 1♂; **Agoseris* 2(2)♀; *Allium* 1♀; **Amorpha* 19(19)♀, 1♂; *Amsinckia* 1♀; *Arctium* 5♂; *Arctostaphylos* 2♀, 1♂; **Arenaria* 1(1)♀; **Argemone* 12(2)♀; *Arnica* 1♀; *Artemesia* 2♀, 4♂; *Aster* 1♂; **Astragalus* 1(1)♀; *Baccharis* 6♀, 8♂; *Baeria* 1♀; **Baileya* 13(3)♀; *Barbarea* 2♀; **Berberis* 20(18)♀; **Brassica* 18(7)♀; *Broadiaea* 1♀; **Calochortus* 8(1)♀, 1♂; *Calycoseris* 1♀; *Camelina* 6♀; **Cardaria* 26(12)♀; *Carthamus* 2♀, 16♂; **Ceanothus* 4(3)♀, 2♂; *Cercidium* 2♀, 1♂; *Cercis* 2♀; **Chaenactis* 5(2)♀; *Chamaebatia* 1♀; *Chilopsis* 1♀; *Chysothamnus* 18♀, 17♂; *Cirsium* 1♀, 1♂; *Citrus* 2♀; **Clarkia* 2(1)♀; **Cleome* 13(9)♀, 2♂; *Condalia* 1♂; **Convolvulus* 4(1)♀; *Coreopsis* 8♀; *Cornus* 1♂; *Crataegus* 1♀, 2♂; *Cryptantha* 16♀; *Curcurbita* 1♀; *Dasylirion* 1♂; *Daucus* 1♂; *Descurainia* 6♀, 1♂; *Dimorphocarpa* 1♀; *Ehretia* 1♀; **Encelia* 12(1)♀; **Eriodictyon* 13(9)♀, 6♂; **Eriogonum* 23(1)♀, 17♂; **Eriophyllum* 3(3)♀, 1♂; **Erysimum* 3(2)♀; **Eschscholtzia* 37(7)♀; *Euphorbia* 3♀; **Fallugia* 1(1)♀, 1♂; **Geraea* 8(3)♀;

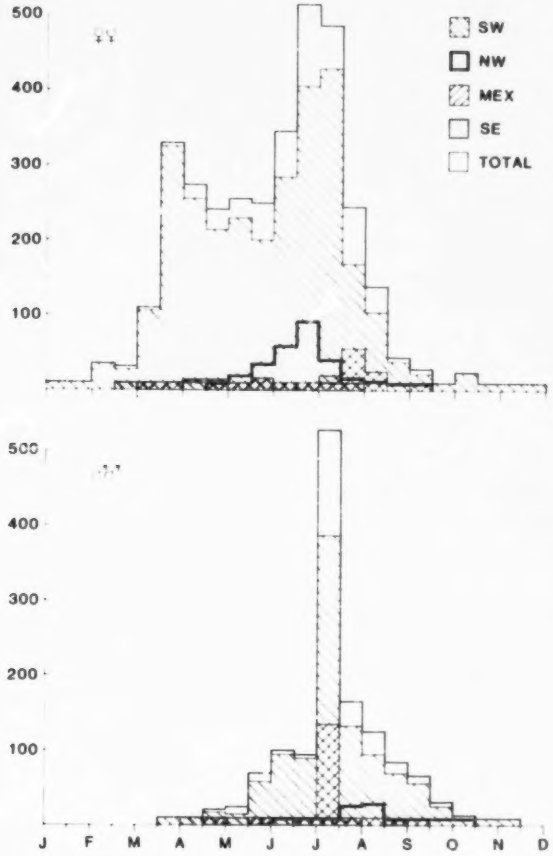


FIGURE 618.—*Lasioglossum sisymbrii* flight records.

Geranium 3♂; **Gilia* 6(1)♀, 1♂; *Gossypium* 1♀, 1♂; *Grindelia* 1♂; **Guarea* 1(1)♀; *Gutierrezia* 6♀, 1♂; *Haplopappus* 2♀; *Helenium* 3♀, 5♂; **Helianthus* 6(2)♀, 1♂; *Hemizonia* 2♀, 1♂; *Heracleum* 1♀; *Hesperochiron* 1♀; *Heterotheca* 2♀; *Hibiscus* 1♀; **Hymenothrix* 2(1)♀; **Hymenoxys* 12(10)♀, 17♂; *Hyptis* 7♀; **Iris* 2(2)♀, 2♂; *Isatis* 1♀, *Isomeris* 1♀; *Juniperus* 1♀; **Kallstroemia* 1(1)♀ *Lantana* 1♀; **Larrea* 28(9)♀; *Layia* 1♀; **Lepidium* 18(3)♀; **Lesquerella* 35(9)♀; *Limnanthes* 1♀, 2♂; *Lindheimera* 1♂; *Linum* 2♀; *Lomatium* 1♀; *Lotus* 6♀; **Lupinus* 6(2)♀; *Lycium* 10♀; *Machaeranthera* 1♀; **Malacothrix* 3(1)♀; *Malvastrum* 3♀; **Marrubium* 3(1)♀; *Medicago* 26♀, 14♂; **Melilotus* 20(3)♀, 24♂; *Mentzelia* 3♀; *Mesembryanthemum* 1♀; *Monardella* 1♀; *Mortonia* 1♂; *Nasturtium* 2♀; *Nemophila* 3♀; *Nolina* 1♂; *Oenothera* 7♀; **Opuntia* 3(2)♀, 1♂; **Oryzopsis* 3(1)♀; *Paeonia* 2♀; *Parkinsonia* 3♀; **Penstemon* 24(10)♀; *Petalostemum* 4♀; **Phacelia* 43(13)♀; *Physaria* 1♀; *Pluchea* 1♀, 1♂; *Poliomintha* 5♀, 10♂; *Polygonum* 1♀; *Potentilla* 5♀, 1♂; **Prosopis* 10(4)♀, 3♂; **Prunus* 7(3)♀, 1♂; *Psoralea* 1♀; *Pyrrhopappus* 1♀; **Ranunculus* 2(1)♀; *Rhamnus* 1♀, 2♂; *Rhus* 4♀, 6♂; *Ribes* 1♀; *Rosa* 1♀; **Salix* 97(24)♀, 1♂; *Salsola* 1♂; *Salvia* 3♀; *Sapindus* 1♀; **Senecio* 4(1)♀, 5♂; **Sisymbrium* 12(4)♀; *Solanum* 8♀, 1♂; *Solidago* 1♀; *Sophia* 1♀; **Sphaeralcea* 35(8)♀; **Stanleya* 14(4)♀; **Tamarix* 42(2)♀, 1♂; **Taraxacum* 16(9)♀; *Tetradymia* 1♀; **Tragopogon* 1(1)♀; *Trichostema* 1♀; *Trifolium* 4♀, 1♂; *Verbesina* 1♂; *Veronica* 1♀; *Vicia* 1(1)♀, 2♂; *Viguiera* 2♀; *Yucca* 2♀.

SPECIMENS EXAMINED.—4940 (3397♀, 1543♂).

CANADA. **Alberta:** Onefour. **British Columbia:** Bowser, Fitzgerald, Lillooet, Lorna, Lytton, Merritt, Nanaimo Biological Station, Osoyoos, Penticton, Qualicum Bay, Royal Oak, Saanich, Sidney, Thompson River, Vernon, Victoria. **Saskatchewan:** Eastend.

MEXICO. **Baja California:** Ensenada, El Progreso (Head of El Tajo Canyon, Sierra Juarez Mts.), Manadero Valley, Palacio (20 mi S), Rosarito Beach, San Felipe (50 mi N), San Pedro Martin, Tecate, 8 mi E. **Chihuahua:** Arroyo Mesteno (Sierra del Nido), Chihuahua (35 mi NW), Hidalgo del Parral (9 mi S), Primavera. **Coahuila:** El Chora (16 km S Saltillo), Torreon. **Durango:** Canutillo, Durango (10 mi W, 14 mi NE, 125 mi SE), El Salto (26 mi E), Guadalupe Victoria (14 mi NE), San Juan del Rio. **Hidalgo:** Zimapan, 20.4 mi SE. **Jalisco:** Lagos de Moreno (15.5–27 mi NE), San Juan Lagos. **Nayarit:** San Blas. **Nuevo Leon:** Monterrey, Saltillo, 41 mi S. **Queretaro:** San Juan del Rio. **San Luis Potosi:** San Luis Potosi, 29 mi SW. **Sonora:** Magdelena. **Zacatecas:** Fresnillo (9 mi SE), San Jose de Felix (1 mi N), Sombrerete (15 km E), Zacatecas.

UNITED STATES. **Arizona:** *Apache Co.; Cochise Co.; Coconino Co.; Gila Co.; Graham Co.; Greenlee Co.; La Paz Co.; Mohave Co.; Maricopa Co.; Navajo Co.; Pima Co.; Pinal Co.; Santa Cruz Co.; Yavapai Co.; Yuma Co.* **California:** *Alameda Co.; Alpine Co.; Calaveras Co.; Contra Costa Co.; El Dorado Co.; Fresno Co.; Imperial Co.; Inyo Co.; Kern Co.; Lassen Co.; Los Angeles Co.;* including Santa Catalina Island; *Madera Co.; Marin Co.;* Mill Valley; *Mariposa Co.; Mendocino Co.:* Howard Lake, 2 air mi N; *Merced Co.:* Yosemite National Park; *Modoc Co.; Mono Co.:* White Mts; *Monterey Co.; Napa Co.:* Calistoga; *Nevada Co.; Orange Co.:* Costa Mesa, Laguna Hills; *Placer Co.:* Appelgate, Brockway; *Plumas Co.:* Greenville, Quincy, 4 mi W; *Riverside Co.; Sacramento Co.:* Folsom, 10–14 mi E; *San Benito Co.; San Bernardino Co.; San Diego Co.; San Francisco Co.; San Luis Obispo Co.:* Santa Margarita, 15 mi E; *San Mateo Co.:* Woodside; *Santa Barbara Co.; Santa Clara Co.; Santa Cruz Co.; Shasta Co.:* Burney (5 mi E), mts. W of Nieubieber; *Sierra Co.:* Sattley, Sierraville, 10 mi S; *Siskiyou Co.; Solano Co.:* Putah Canyon; *Stanislaus Co.:* Del Puerto Canyon (18 mi W Patterson), Turlock, 8 mi E; *Turlare Co.; Tuolumne Co.; Ventura Co.*, including Middle Anacapa Island; *Yolo Co.:* Davis; *Yuma Co.:* Mohawk, 9.5 mi W.

Colorado: *Adams Co.; Alamosa Co.; Boulder Co.; Chaffee Co.; Costilla Co.; Delta Co.; Denver Co.; Douglas Co.; Eagle Co.; El Paso Co.; Fremont Co.; Garfield Co.; Grand Co.; Gunnison*

Co.; Huerfano Co.; Jefferson Co.; Larimer Co.; Las Animas Co.; Mesa Co.; Moffat Co.; Montezuma Co.; Ouray Co.; Park Co.; Pueblo Co.; Rio Blanco Co.; Routt Co.; Saguache Co.; Teller Co.; Weld Co. IDAHO: *Ada Co.:* Nampa, 15 mi S; *Bannock Co.:* Pocatello; *Binghamm Co.:* Blackfoot; *Bonner Co.; Boundary Co.; Bear Lake Co.:* Bloomington Canyon; *Cassia Co.; Custer Co.; Elmore Co.:* Dixie, 3 mi W; *Franklin Co.; Fremont Co.:* St Anthony Dunes; *Gooding Co.:* Bliss, 5 mi N; *Idaho Co.:* Riggins; *Kootenai Co.; Latah Co.; Lemhi Co.:* North Fork, 3 mi N; *Minidoka Co.:* Rupert, 10 mi E; *Nez Perce Co.; Oneida Co.:* Black Pine Mt., Rock Creek; *Owyhee Co.; Teton Co.:* Tetonia, 7 mi W; *Twin Falls Co.:* Hollister; *Washington Co.:* Midvale. LOUISIANA: *Orleans Co.:* New Orleans, "through C.V. Riley" (2♀; USNM). MONTANA: *Broadwater Co.:* Townsend, 14 mi E; *Carbon Co.:* Rosebud Canyon; *Clark Co.:* Helena, 10 mi N; *Fergus Co.:* Big Snowie Mts.; *Flathead Co.:* Flathead Lake; *Gallatin Co.:* Bozeman, 6–20 mi S; *Granite Co.:* Clinton, 9 mi S; *Madison Co.:* Alder, 9 mi S; *Missoula Co.:* Missoula.

NEW MEXICO: *Bernalillo Co.; Catron Co.; Chaves Co.; Colfax Co.; De Baca Co.; Dona Ana Co.; Eddy Co.; Grant Co.; Hildalgo Co.; Lea Co.; Lincoln Co.; Los Alamos Co.; McKinely Co.; Mora Co.; Otero Co.; Sandoval Co.; San Juan Co.; San Miguel Co.; Santa Fe Co.; Socorro Co.; Taos Co.; Torrance Co.; Union Co.; Valencia Co.:* Laguna, 3 mi E. NEVADA: *Churchill Co.:* Frenchman (10 mi W), Stillwater (12 mi NE); *Clark Co.; Douglas Co.:* Carson City; *Elko Co.; Esmeralda Co.:* Lida; *Eureka Co.; Humboldt Co.:* Paradise Valley (18 mi N), Winnemucca (20 mi S); *Lander Co.; Lincoln Co.; Mineral Co.:* Luning; *Nye Co.; Washoe Co.; White Pine Co.* OREGON: *Baker Co.; Benton Co.; Crook Co.:* Canyon Creek Canyon; *Deschutes Co.; Grant Co.:* Dayville, 14 mi W; *Harney Co.; Hood River Co.:* Hood River; *Jackson Co.:* Colestin; *Jefferson Co.; Josephine Co.:* O'Brien; *Klamath Co.; Lake Co.; Linn Co.:* Green Peter Lake, Lebanon; *Malheur Co.:* Vale; *Marion Co.:* Salem; *Polk Co.; Umatilla Co.:* Milton-Freewater; *Union Co.:* La Grande Union; *Wallowa Co.; Wasco Co.:* Mosier, The Dalles; *Washington Co.:* Forest Grove; *Wheeler Co.:* Fossil, 10 mi S.

SOUTH DAKOTA: *Custer Co.:* Custer State Park; *Pennington Co.:* Keystone, 4 mi SE. TEXAS: *Brewster Co.; Culberson Co.; Dallam Co.:* Dalhart; *El Paso Co.; Hidalgo Co.:* McAllen; *Hudspeth Co.:* Dell City, 9 mi SW; *Jeff Davis Co.; Jim Hogg Co.:* Hegronville, 33 mi SW; *Lee Co.:* unspecified locality; *Mason Co.:* Mason, 10 mi N; *Presidio Co.:* Marfa (11 mi W), Redford (20 mi SE); *Randall Co.:* near Palo Duro Canyon; *Reeves Co.:* Balmorhea, Pecos, 16 mi S; *Terrell Co.:* Dryden, 10.7 mi S; *Uvalde Co.:* Uvalde; *Val Verde Co.:* Bakersfield, Quemada; *Ward Co.:* Monahans; *Webb Co.:* Laredo, 2 mi N; *Zapata Co.:* San Ygnacio. UTAH: *Beaver Co.; Box Elder Co.; Cache Co.; Davis Co.; Emery Co.; Garfield Co.; Iron Co.; Juab Co.; Kane Co.; Millard Co.; Piute Co.:* Circleville, *Rich Co.; Salt Lake Co.; Summit Co.; Tooele Co.; Uintah Co.; Utah Co.; Washington Co.; Wayne Co.; Weber Co.* WASHINGTON: *Chelan Co:* Cashmere, Wenatchee; *Clark Co.:* Vancouver; *Garfield Co.:* Pomeroy; *King Co.:* Seattle; *Klickitat Co.:* Klickitat; *Okanogan Co.:* Okanogan; *San Juan Co.:* Orcus Island, San Juan Island; *Skagit Co.:* Anacortes, 5 mi S; *Spokane Co.:* Spokane; *Stevens Co.:* Rice; Thurston Co.: Olympia; *Walla Walla Co.:* Walla Walla; *Whitman Co.; Yakima Co.* WYOMING: *Albany Co.; Carbon Co.:* Medicine Bow; *Fremont Co.:* Dubois, 13 mi SW; *Laramie Co.:* Cheyenne, Pine Bluffs' *Sheridan Co.:* Sheridan. *Uinta Co.:* Lyman, 20 mi E; *Yellowstone National Park Co.:* Yellowstone National Park, south gate.

40. *Lasioglossum timberlakei*, new species

FIGURES 53, 554, 619–630

TYPE MATERIAL.—The female holotype of *L. timberlakei* is in the National Museum of Natural History, Smithsonian Institution. The specimen is in good condition and is labeled

Los Angeles Co.[unty], CAL.[ifornia]/HOLOTYPE Lasioglossum timberlakei R.J. McGinley [red label].

The holotype is what herein is referred to as the "dark form" of *L. timberlakei* (it has fulvous pubescence and linear, regularly spaced propodeal striae; see "Diagnosis" and "Remarks" sections). Two hundred sixty-three paratypes are designated and listed in the "Specimens Examined" section.

ETYMOLOGY.—As discussed in the "Remarks" section below, P.H. Timberlake's manuscript name "fulvohirtus," which refers to the fulvous hairs found among the dark forms in Riverside, California, is not an appropriate epithet, because many specimens (especially those found in the Sierra Nevada) have white pubescence. I therefore name this species after Mr. Timberlake, who first recognized this as a new species and who contributed so much to our knowledge of North American bees.

DISTRIBUTION (Figure 554).—*Lasioglossum timberlakei* is sympatric with the very similar *L. pacificum* along the Pacific coastal area of California and probably in Oregon as well. The dark form of *L. timberlakei* is primarily found in southern California (Los Angeles, Orange, Riverside, and Ventura counties), but one specimen has been taken in central California (Monterey County). The light form is found in Monterey County, south to San Diego County and north through the Sierra Nevada to southern Oregon.

DIAGNOSIS.—The obscure, poorly developed mesoscutal punctation (Figure 622), short, dense pubescence along the posterolateral mesoscutal edge, and highly sculptured dorsal propodeal surface (Figures 623, 624) will distinguish the females of *L. timberlakei* from other New World *Lasioglossum*. There are two forms of this species: a "dark form" with conspicuously fulvous pubescence and a linearly striated dorsal propodeal surface (Figure 623) and a "light form" with white pubescence and an irregularly striated propodeum (Figure 624). See "Remarks" section for further details.

Lasioglossum pacificum is very similar to *L. timberlakei* but is a larger bee (length 8.4–10.8 mm, x̄ = 9.6 mm vs. 7.4–10.2 mm, x̄ = 8.7 mm), has distinctly formed mesoscutal punctation (Figure 560), and elongate hairs along the posterolateral mesoscutal edge.

The males of *L. timberlakei* are similar to *L. pacificum* in having elongate hair tufts on the lateral edges of sternum V. However, the hair margin along the posterior edge of sternum V is more narrowly rounded in *L. timberlakei* (Figure 562) than in *L. pacificum*, in which the posterior hair margin is broadly rounded (Figure 561). The males of the light form of *L. timberlakei* are easily separated by their irregularly striate to nearly scabrous dorsal propodeal surface. See the "Diagnosis" of *L. pacificum* for further details concerning superfically similar species.

DESCRIPTION.—FEMALE: (1) Length 7.4–10.2 mm (x̄ = 8.7, n = 30); (2) wing length 2.2–2.8 mm (x̄ = 2.6, n = 30); (3) abdominal width 2.6–3.4 mm (x̄ = 2.9, n = 30).

Structure: (4) Head short (Figure 619; length/width ratio 0.79–0.92, x̄ = 0.82, n = 30). (7) Supraclypeal area evenly rounded, (8) weakly protuberant. (9) Clypeus projecting approximately 0.68–0.78 of its length below lower margin of eyes; (11) surface without median longitudinal sulcation. (14) Distance between lateral ocelli subequal to distance between lateral ocellus and eye. (23) Flagellomere 1 subequal in length to 2 along dorsal surface. Labrum as in Figure 620; (27) distal keel narrow in frontal view, nearly parallel-sided; (28) distal lateral projections virtually absent, evident as obscure swellings; (29) fimbrial setae acutely pointed.

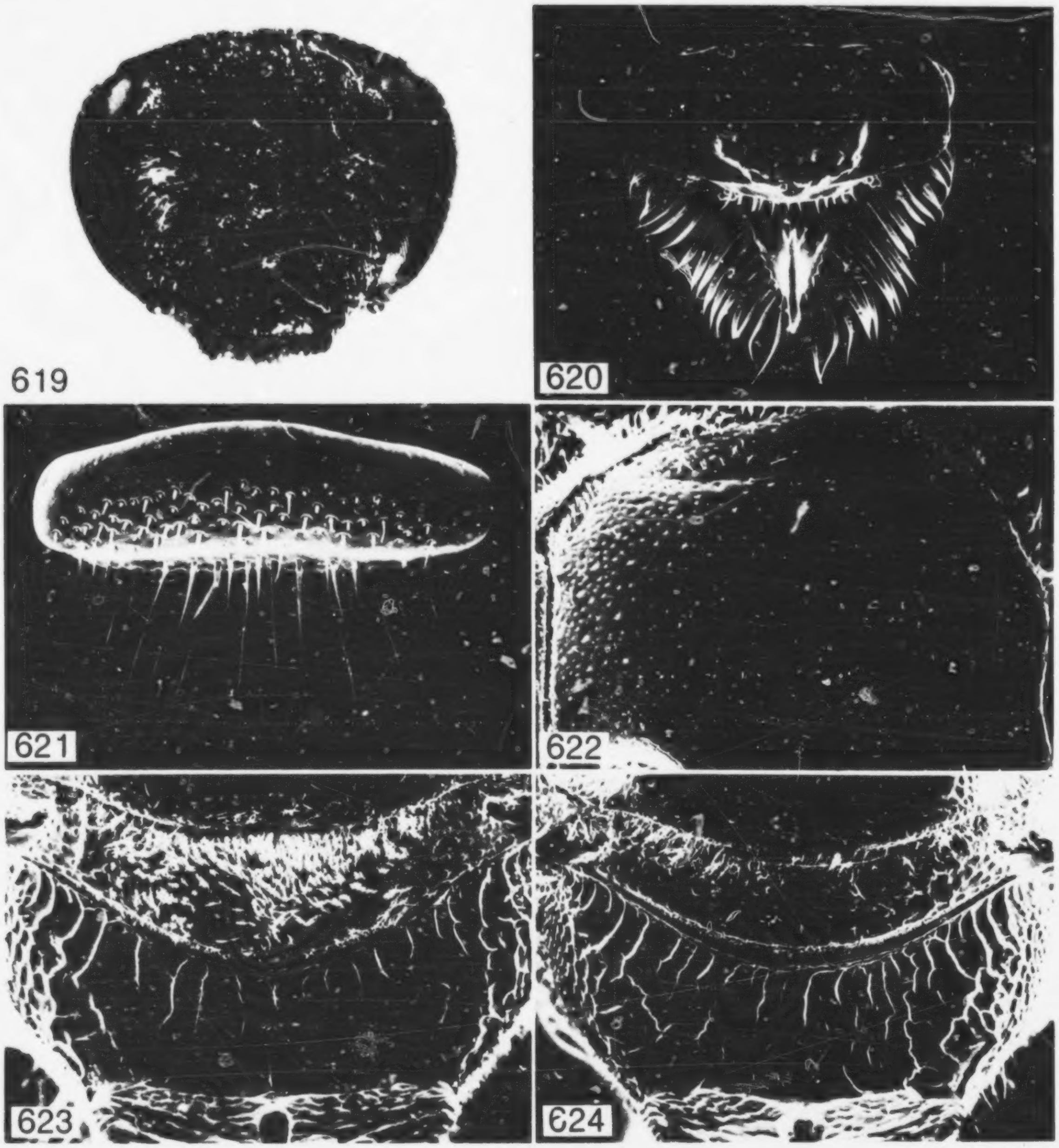
(32) Pronotal lateral angle broadly obtuse; (33) pronotal lateral ridge incomplete, broadly interrupted by oblique lateral sulcus; (34) lower portion of lateral ridge inconspicuous, broadly rounded. (35) Mesoscutal lip weakly bilobed, (36) moderately elevated from pronotum. (40) Dorsal surface of propodeum about 0.72–0.73 the length of scutellum and about 1.2–1.3 times the length of metanotum, (41) not depressed centrally, (42) posterior margin truncated (slightly bowed posteriad); (43) propodeal triangle weakly defined laterally; (44) lateral carinae completely encircling posterior surface. (45) Tibial spur as in Figure 53.

(46) Lateral edge of metasomal tergum II weakly sinuate.

Sculpture: (47) Face shiny, (48) densely and uniformly punctate between ocelli and antennae, punctures contiguous. (51) Supraclypeal area extremely granulate; (52) punctures separated by their width or less laterally, becoming only slightly less dense centrally. (53) Clypeus granulate basally, apical three-fourths polished; (54) punctures separated by less than their width basally, becoming less dense apically. (56) Mesoscutum shiny; (57) punctation as in Figure 622, indistinctly doubly-punctate, smaller punctures inconspicuous, 2–3 times their width apart, larger punctures poorly defined, widely spaced, 5–6 times their width apart. (58) Scutellum virtually impunctate adjacent to median line. (63) Dorsal surface of propodeum (Figures 623, 624) irregularly porcate, striae reaching posterior margin; (64) surface smooth, not alveolated. (65) Metasomal tergum I shiny; (66) punctation extremely fine, sparse posteriorly, punctures 2–3 times their width apart, punctures scattered anteriorly with large impunctate areas.

Coloration: (71) Wing membrane nearly hyaline, very lightly pigmented.

Vestiture: (74) Pubescence of head white to fulvous. (75) Pubescence of thorax white to fulvous; (76) mesoscutal hairs moderately sparse



FIGURES 619–624.—*Lasioglossum timberlakei:* 619, female head; 620, female labrum; 621, male labrum; 622, female mesoscutum; 623, female propodeum, dark form; 624, female propodeum, light form.

and plumose; as in *L. sisymbrii*, mesoscutal hairs along lateroposterior edge short, adpressed. (77) Hind tibial hairs concolorous, golden, to weakly differentiated in color with light brown dorsal hairs. (78) Anterior hairs of metasomal tergum I and (79) basal hair bands of terga II–IV yellowish white to pale yellowish brown. (80) Acarinarium absent, elongate hairs scattered over anterior surface of tergum I. (81) Unlike most species, basal hair band of tergum II conspicuously narrowed (not interrupted as in *L. pacificum*).

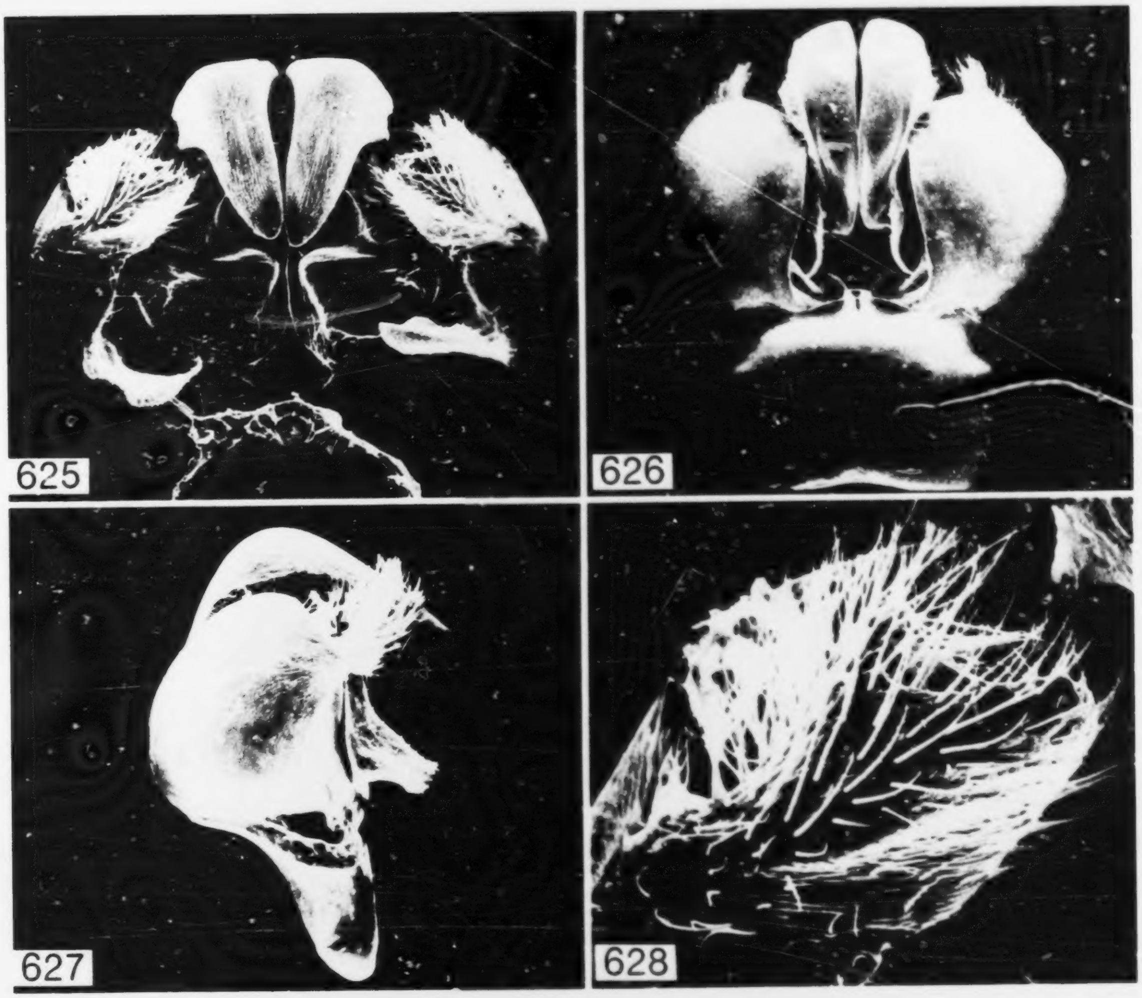
MALE: Similar to female except as follows: (1) length 6.4–8.0 mm ($\bar{x}$ = 7.3, n = 24); (2) wing length 2.0–2.3 mm ($\bar{x}$ = 2.2, n = 24); (3) abdominal width 1.8–2.2 mm ($\bar{x}$ = 2.0, n = 24). (4) Head short (length/width ratio 0.77–0.90, $\bar{x}$ = 0.85, n = 24). (5) Gena narrower than eye, (5) rounded, not produced posteriorly. (10) Clypeal surface broadly rounded, not flattened or depressed. Labrum as in Figure 621; (24) distal process absent; (25) basal area rounded medially, not depressed; (26) basal lateral depressions absent. (30) Mandible very short, not reaching opposing clypeal angle. (53) Clypeus weakly granulate, shiny; (54) punctation nearly uniform throughout, punctures separated by 1–2 times their width. (68) Clypeal maculation absent. (69) Flagellum only very slightly paler ventrally than on dorsum. (72) Tarsi dark, concolorous with tibiae.

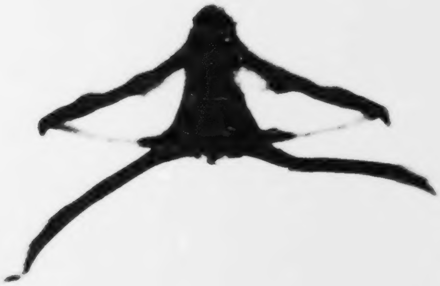
Vestiture: Sternal vestiture as in Figure 562; (82) sternum IV with apical fringe of suberect, plumose hairs; (83) sternum V with apical fringe of adpressed hairs that become longer laterally, forming lateral hair tufts similar to but not so developed as those of *L. pacificum* (margin of hair fringe sinuate, not evenly and broadly rounded as in *L. pacificum*).

Terminalia: Sterna VII–VIII as in Figure 629; (85) median process of sternum VIII absent except for very slight median convexity. Genitalia as in Figures 625–628; (86) gonobase moderately elongate; (87) gonostylus moderately large, robust and bluntly rounded, with conspicuous lateral fold; (89) retrorse membranous lobe slightly reduced, very slender basally, expanding to rounded apex (similar to that of *L. sisymbrii*); (90) volsella broadly projecting laterally but lacking prominent lateral lobe.

REMARKS.—P.H. Timberlake apparently was the first worker to recognize *L. timberlakei* as being distinct from *L. pacificum*, to which it is very similar. Timberlake labeled a large series of specimens in the University of California, Riverside collection "Halictus fulvohirtus Timb." (an unpublished manuscript name; specimens from Riverside, California). These specimens, having fulvous pubescence and near linear, distinctly spaced propodeal striae (Figure 623), correspond to what I herein refer to as the dark form of *L. timberlakei*. While preparing the specimens for shipment to me, S.I. Frommer, Curator of the Riverside Entomology Collection, noted that Timberlake had associated with the specimens labeled "H. fulvohirtus" a shorter, unlabeled series. The latter specimens have white pubescence and irregularly striate dorsal propodeal surfaces (Figure 624; striae not linear and distinctly spaced as in other form). I herein refer to these specimens as the light form of *L. timberlakei*. Timberlake labeled a white form specimen in the University of California, Berkeley collection "Halictus n. sp." Whether or not these forms deserve individual specific status is uncertain at present. A few specimens appear to be somewhat intermediate in having conspicuously fulvous pubescence and an irregularly striate dorsal propodeal surface typical of the white forms. The dark form, known primarily from southern California, is most commonly collected in February and March. The light form is also found along the southern Pacific coastline but also occurs through the Sierra Nevada north to southern Oregon; it has most commonly been collected in June. The only early season records for the light form are one female collected in February and one female from March, both from Riverside County. Interestingly, both specimens are intermediate forms as described above.

Although hair coloration is noticeably variable, the propodeal sculpturing, though somewhat variable, appears to consistently differentiate





FIGURES 625–629.—*Lasioglossum timberlakei,* male: 625, genitalia, ventral view; 626, same, dorsal view; 627, same, lateral view; 628, gonostylus; 629, sterna VII–VIII.

both forms at present, hence it is this feature that is used to separate the forms in this study, not hair coloration. However, given the variability of propodeal sculpturing in combination with the relative paucity of known specimens (especially males) and given the intermediate forms for hair color and propodeal sculpture, I hesitate recognizing two species at present. Some workers might designate two subspecies in this case but I prefer to avoid formalizing such uncertainty.

FLIGHT RECORDS (Figure 630).—Most of the *L. timberlakei* dark form specimens (84%) were collected by P.H. Timberlake in Riverside, California, from 1925 to 1958. Females were collected in every month from late January through early October except August. Most records (73%) are from February and March. The two males associated with the dark form were taken in October and December.

The light forms of *L. timberlakei* have most commonly been taken in June (56%), with the records ranging from February through September. The one light form taken in February was from Riverside, California; it appears to be an intermediate form in having rich, fulvous pubescence like the dark form but the irregularly striate propodeal surface of the light form. The one March record was also from Riverside County (Cedar Crest) and was an intermediate specimen like the above form. Other intermediate forms have been collected later in the year, for example: one female, Ventura County, California, 15 May 1971 (UCR); one female, Mono County, California, 25 August 1979 (CDA).

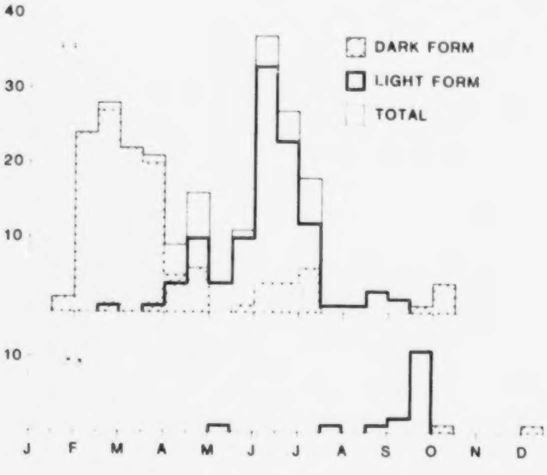


FIGURE 630.—*Lasioglossum timberlakei* flight records.

FLOWER RECORDS.—Dark form females (103): Salicaceae 40%; Cruciferae 35%; Compositae 7%. One male taken from *Baccharis*. Total: 104 in 10 familes, 16 genera as follows:

Alyssum 1♀; *Amsinckia* 1♀; *Baccharis* 5♀, 1♂; *Brassica* 1♀; *Capsella* 2♀; *Cryptantha* 1♀; **Erodium* 3(1)♀; **Eschscholtzia* 1(1)♀; *Rhus* 1♀; **Salix* 41(2)♀; **Sambucus* 2(1)♀; **Schinus* 2(1)♀; **Sedum* 5(1)♀; **Sisymbrium* 32(3)♀; **Solanum* 3(2)♀; *Sonchus* 2♀.

Light form females (16): Salicaceae 25%; Rhamnaceae 19%; Rosaceae 12%. Males (5): Compositae 100%. Total: 21 in 10 families, 15 genera as follows:

Arctostaphylos 1♀; *Aster* 1♂; **Ceanothus* 2(2)♀; *Chrysothamnus* 2♂; *Cryptantha* 1♀; *Eriogonum* 1♀; *Gutierrezia* 1♂; *Haplopappus* 1♂; **Phacelia* 1(1)♀; *Prunus* 2♀; *Rhamnus* 1♀; **Salix* 4(2)♀; *Samucus* 1♀; **Sisymbrium* 1(1)♀; *Solidago* 1♀.

SPECIMENS EXAMINED.—Paratype dark forms: 127 (125♀, 2♂).

UNITED STATES. CALIFORNIA: *Los Angeles Co.:* El Monte, 27 Apr 1971 (1♀; UCR); Irwindale, 11 Mar 1936, P.H. Timberlake; Los Angeles (1♀; USNM), 23 Mar 1935, K. Holland (1♀; LACM); Pasadena, 21 Dec 1897 (1♂, AMNH), 7 Jul 1933, C.D. Michener (1♀; AMNH), 17 Feb 1934, C.D. Michener (1♀; AMNH), 15–24 Mar 1944 (2♀; MCZ), 8 Apr 1915, R.C. Osburn (1♀; OhS); San Fernando Valley, 22 Sep 1917, R. May (1♀; UCB); West Hollywood Hills, 25 Jun 1950, R. Howell (1♀; UCB); Westwood Hills, 20 Feb 1937, E.G. Linsley (2♀; UCB), 3 Apr 1937, N.F. Hardman (1♀; UCB). *Monterey Co.:* San Ardo, 6 Jun 1966, R.L. Langston (1♀; UCB). *Riverside Co.:* Riverside, P.H. Timberlake (105♀, 1♂; UCR), 1 Oct 1939, C. Dammers (1♀; LACM). *Orange Co.:* Fullerton, 26 Jun 1959, C.A. Toschi (1♀; UCB). *Ventura Co.:* Fillmore, 9 Jun 1957, W.F. Simonds (1♀; CDA); Foster Park, 25 Jun 1959, M. Bruck (1♀; UCD), 1 Jul 1959, F.D. Parker (1♀; UCD); Santa Paula, 6 Jun 1926 (1♀; UCB).

Paratype light forms: 136 (121♀, 17♂).

UNITED STATES. CALIFORNIA: *Calaveras Co.:* Railway Flat, 4 mi S, May 1969, E.G. Linsley (1♀; UCB). *El Dorado Co.:* Pollock Pines, 22 Jun 1948, L.W. Quate (1♀; UCB), 10 Jun 1952, P.H. Arnaud (1♀; CAS); Strawberry Valley, 13 Aug 1912, E.C. Van Dyke (1♀; CAS); Wright's Lake, 2 Jul 1948, P.D. Hurd (1♀; UCB). *Fresno Co.:* Shaver Lake, 15 Jul

1968, J.B. Hoy (1♀; UCB). *Kern Co.:* Alta Sierra, 5 mi E, 10 Jul 1955, B. Hudson (1♀; UCB); Walker Pass, 26 Apr 1949, E.G. Linsley, J.W. MacSwain, R.F. Smith (1♀; UCB). *Los Angeles Co.:* Angeles Crest, 16 Jun 1957 (1♀; LACM); Crystal Lake, 1–9 Jul 1952, A.T. McClay, L. Stange (2♀; LACM, UCD); San Gabriel River (East Fork), 30 Apr 1961, R.L. Westcott (1♀; LACM); Tanbark Flat, 17–20 Jun 1950, H.L. Hansen, P.D. Hurd, A.T. McClay (4♀; UCB, UCD), 18–19 Jun 1956, H.W. Michalk, L.W. Shainberg, L.A. Stange (4♀; CDA, LACM, UCD). *Madera Co.:* Oakhurst, 19 May, 1 Jun 1942 (2♀; UCB). *Mariposa Co.:* Yosemite, 8–25 Jun 1921, E.C. Van Dyke (4♀; CAS), 5 Jul 1927, E.H. Nast (1♀; CAS), 7–8 Jun 1931 (3♀; UCB, UCR), 20 May 1934 (1♀; CAS), 10–16 Jun 1935, A.L. Melander (14♀; MCZ), 30 May, 15 Jun 1938, N.F. Hardman (3♀; UCB).

Mono Co.: Mill Creek Canyon (7 mi S Junction Highway 395), 25–26 Aug 1979, M. Wasbauer, P. Adams (1♀; CDA); West Walker River, 17 May 1937, C.D. Michener (2♀; KU). *Monterey Co.:* Arroyo Seco Camp, 23 Jun 1967, R.F. Denno (2♀; UCD), 6 Apr 1968, R.O. Schuster (3♀; UCD), 25 Apr 1976, R.W. Brooks (1♀; RWB), 1.5–5 air mi S, 3–7 May 1975, J. Powell, R. Wharton (3♀; UCB); Bryson, 18 May 1920, E.P. VanDuzee (2♀; CAS); Hastings Natural History Reservation (Jamesburg), 12 Jun 1938, C.D. Michener (1♀; KU); Los Padres Dam (Carmel Valley) 24 Jun 1967, R.F. Denno (1♀; UCD). *Plumas Co.:* Quincy, 4 mi W, 19–20 Jun 1949, P.D. Hurd, J.W. MacSwain (2♀; UCB), 3 Jul 1949, E.I. Schlinger (1♀; UCD). *Riverside Co.:* Cedar Crest (San Jacinto Mts.), 16 Mar 1940, P.H. Timberlake (1♀; UCR); Keen Camp, 8 mi W (San Jacinto Mts.), 1 Jun 1939, E.S. Ross (1♀; UCB); Riverside, 16 Feb 1934, P.H. Timberlake (1♀; UCR), 6 Apr 1940, P.H. Timberlake (1♀; UCR); Santa Ana River, 23 Aug 1952, P.H. Timberlake (1♀; UCR), upper Santa Ana River, 26 Jun 1948, A.L. Melander (2♀; UCR), 7 Sep 1952, A.L. Melander (1♀; USNM).

San Bernardino Co.: Barton Flats, 23 Sep 1946, N. Crickmer (1♂; KU); Cajon Pass, 2 mi W, 7 Jun 1958, J.C. Hall (2♀; UCD); Camp Angelus, 25 Aug 1953, A.L. Melander (1♂; USNM); Mt. Home Canyon, 22 Sep 1953, A.L. Melander (2♂; USNM), 27 Sep 1955, A.L. Melander (2♂; USNM); Mt. Howe Creek (San Bernardino Mts.), 4 Jul 1935, P.H. Timberlake (1♀; UCR); Seeley Flats (San Bernardino Mts.), 2–4 Jul 1917, R. May (2♀; UCB); Seven-Oaks, 21 Sep 1952, A.L. Melander (2♂; USNM); Tetley Park, 23 May 1936, E.G. Linsley (1♀; UCB); upper Santa Ana River, 24 Sep 1923, E.P. VanDuzee (2♂; CAS), 24 Aug 1946, G.H. & J.L. Sperry (4♂; AMNH, KU). *San Diego Co.:* Lake Henshaw, 4 mi W, 19 Jun 1965, G.R. Ballmer (1♀; UCR); Mt. Laguna, 14 May, 19 Jun 1971, A.R. Moldenke (1♀, 1♂; CU); Mt. Palomar, 24 Jul 1961, G.C. Eickwort (1♀; MSUEL), 28 Jun 1963, I.H. Pogojeff (1♀; UCD). *San Luis Obispo Co.:* La Panza Camp (12 mi NE Pozo), 29 Apr 1962, J. Powell (1♀; UCB). *Santa Barbara Co.:* Goleta, 9 Jul 1959, W.A. Steffan (1♀; UCB); Los Prietos, 4 mi E, 25 Jun 1965, J. Powell (1♀; UCB). *Shasta Co.:* Big Springs, 23 May 1941 (1♀; UCB); Hat Creek, 20–21 Jun 1955, J.W. MacSwain, E.E. Lindquist, R.D. Browning, J.R. Jessen, A.J. Muller, J.C. Weils (2♀; UCB; 4♀, UCD), 3 mi N, 5 Jun 1941 (1♀; UCB); Mt. Shasta, 26 Sep 1977, R.O. Schuster (7♀, 2♂; UCD); Old Station, 22–24 Jun 1955, J.R. Jessen (2♀; UCD); Shingletown, 2 Jun 1941, P.D. Hurd (1♀; UCB).

Siskiyou Co.: Ash Creek Ranger Station (9 mi E McCloud), 7–9 Jun 1974, J. Sorenson, R. Coville (2♀; UCB); McBride Springs (3 mi NNE Mt. Shasta City), 3 Jul 1963, C.D. MacNeill (1♀; CAS). *Trinity Co.:* Junction City, 30 Jun 1975, T.R. Haig (1♀; CDA). *Tulare Co.:* Johnsondale, 2 mi E, 27 Apr 1964, R.L. Langston, C.A. Toschi (6♀; UCB). *Ventura Co.:* Sespe Wildlife Area, 15 May 1971, UCR Field Ent. (1♀; UCR).

NEVADA: *Douglas Co.:* Valley Hot Springs, 24 Jun 1953, R.C. Bechtel (1♀; UCD). *Washoe Co.:* Galena Creek, 30 April 1961, F.D. Parker (1♀; UCD), 26 Jun 1965, E.L. Smith (1♀; UCD). OREGON: *Jackson Co.:* Ashland, 2 Jun 1954, C. Fitch (1♀; UCD).

41. *Lasioglossum titusi* (Crawford)

FIGURES 54, 62, 631–644

Halictus Titusi Crawford, 1902:2 [female]; 1906:302 [locality records].

Lasioglossum titusi.—Michener, 1951:1107 [Nearctic catalog].—Linsley and MacSwain, 1959:22, 29 [flight records, association with *Ranunculus*, mites].—Linsley et al., 1963:42 [locality and flower records].—Whitsel and Schoeppner, 1971:223 [mites].—Moldenke and Neff, 1974:58 [locality and flower records].—Bohart and Youssef, 1976:193 [pollen preference].—Delfinado and Baker, 1976:286 [mites].—Eickwort, 1979:579 [mites].—Hurd, 1979:1958 [Nearctic catalog].—Hurd, et al., 1980:27, 66 [flower records].

TYPE MATERIAL.—The holotype of *Halictus titusi* could not be located and is presumed to be lost. In his original description, Crawford (1902) stated that "the specimens on which this paper is based are in the collection of the University of Nebraska, unless otherwise stated." Dr. Brett C. Ratcliffe kindly checked the Nebraska collection but could not locate any type material for this species. Although there are two specimens in the collection of the National Museum of Natural History labeled "cotype," they lack primary type status, because Crawford's only mention of the type series was "type from San Diego, Calif." Fortunately, *Lasioglossum titusi* is a very distinctive bee, and Crawford's original description clearly associates the name with the "cotypes" and other specimens commonly believed to be conspecific. Designation of a neotype is unnecessary.

DISTRIBUTION (Figure 631).—*Lasioglossum titusi* has heretofore been reported only from California and Oregon (Hurd, 1979). It is now known to occur from southern British Columbia through Washington and south through coastal southern California to Baja California Norte, including East Anacapa, San Miguel, Santa Cruz, and Santa Rosa Islands. To the east the species follows the Rocky Mountain system into northern Utah and western Colorado.

DIAGNOSIS.—Females of *Lasioglossum titusi* can be readily recognized by their very sparse mesoscutal punctation (Figure 637). The mesoscutum is actually obscurely doubly-punctate with the smaller, inconspicuous punctures separated by 2–4 times their width and the larger punctures separated by 2–3 times their width laterally, becoming extremely sparse centrally. The propodeal dorsal surface is regularly and distinctively striolate (Figure 636) and is unique among western *Lasioglossum* in being only slightly longer than the metanotum. Additional characters helpful in recognizing *L. titusi* are the moderately short head (Figure 632), the shiny and sparsely punctate vertex between the lateral ocellus and the compound eye (Figure 124), and the noticeably dull metasoma with relatively inconspicuous gray-white basal hair bands. Furthermore, this is the only *Lasioglossum* species associated with scutacarid mites that cling to the hairs on the posterior propodeal surface of the female bee (Figure 75; the histiostomatid mites associated with other *Lasioglossum* females are found on an acarinarium on the anterior surface of the first metasomal tergum of the host).

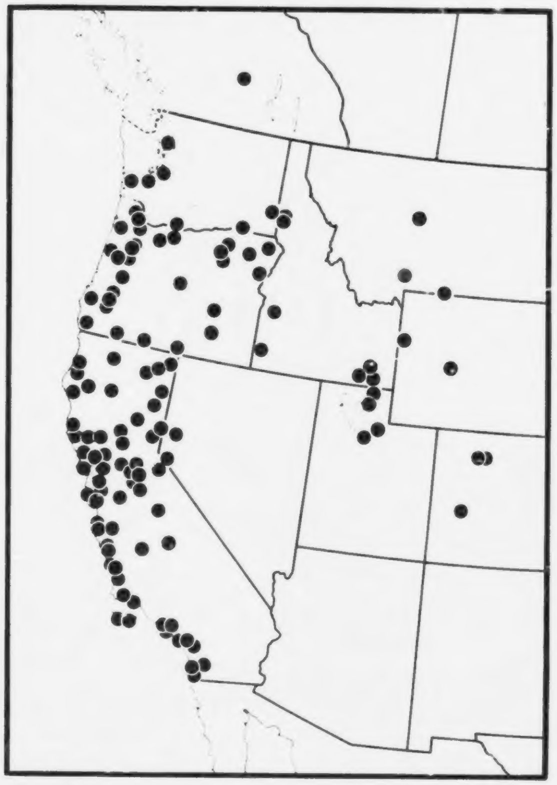
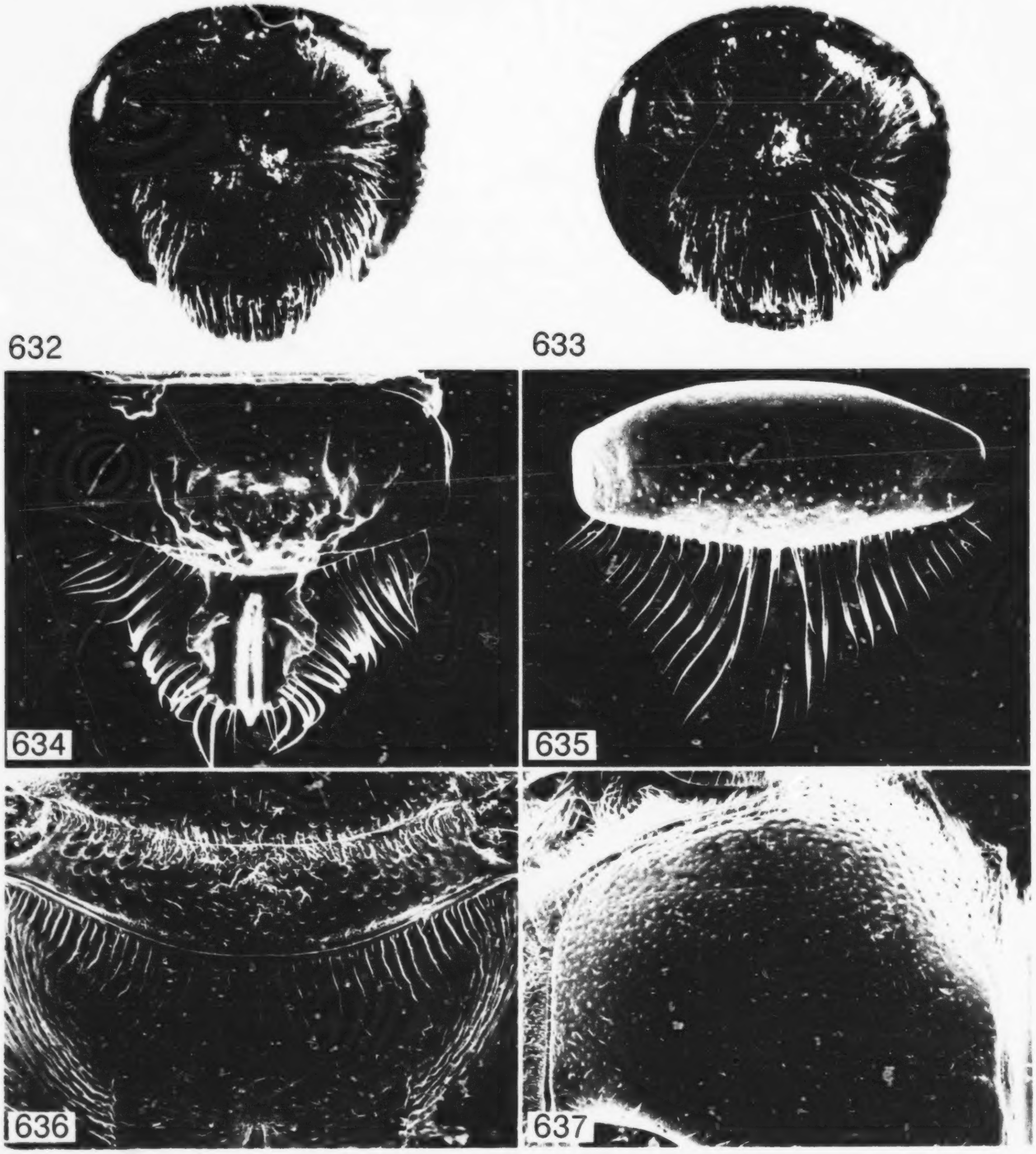


FIGURE 631.—Distribution of *Lasioglossum titusi.*

The mesoscutal punctation of male *L. titusi* is extremely sparse, more so than that of the female. The punctures are fine and inconspicuous on a highly polished mesoscutal surface. The fine mesoscutal punctation in combination with the yellow tarsi of all three pairs of legs will differentiate *L. titusi* males from all other North American *Lasioglossum* (other species with yellow tarsi have well-developed mesoscutal punctation). Also helpful in recognizing males of this species are the regularly striolate dorsal propodeal surface (similar to that of the female, Figure 636) and the relatively simple sternal vestiture (Figure 198).

DESCRIPTION.—FEMALE: Length 7.3–10.0 mm ($\bar{x} = 8.8$, $n = 15$); (2) wing length 2.3–2.7 mm ($\bar{x} = 2.4$, $n = 15$); (3) abdominal width 2.8–3.5 mm ($\bar{x} = 3.2$, $n = 15$).

Structure: (4) Head short (Figure 632; length/width ratio 0.85–0.92, $\bar{x} = 0.88$, $n = 15$). (7) Supraclypeal area evenly rounded, (8) very weakly protuberant. (9) Clypeus projecting approximately 0.75 of its length below lower margin of eyes; (11) surface without median longitudinal sulcation. (14) Distance between lateral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FIGURES 632–637.—*Lasioglossum titusi:* 632, female head; 633, male head; 634, female labrum; 635, male labrum; 636, female propodeum; 637, female mesoscutum.

ocelli subequal to distance between lateral ocellus and eye. (23) Flagellomere 1 longer than 2 along dorsal surface. Labrum as in Figure 634; (27) distal keel narrow in frontal view, parallel-sided; (28) distal lateral projections well developed, unlike all other species, projections conspicuously truncated; (29) fimbrial setae acutely pointed.

(32) Pronotal lateral angle broadly obtuse; (33) pronotal lateral ridge incomplete, broadly interrupted by oblique lateral sulcus; (34) lower portion of lateral ridge inconspicuous, broadly rounded. (35) Mesoscutal lip rounded, not bilobed, (36) moderately elevated from pronotum. (40) Dorsal surface of propodeum very short, about 0.54 the length of scutellum and subequal to metanotum in length, (41) not depressed centrally, (42) posterior margin broadly rounded; (43) propodeal triangle weakly defined, evident medially as a low V-shaped elevation with weak lateral rims extending towards metanotum; (44) lateral carinae extending nearly to dorsal surface. (45) Tibial spur as in Figure 54.

(46) Unlike other species, lateral edge of metasomal tergum II broadly and evenly rounded (Figure 62).

Sculpture: (47) Face shiny, (48) densely punctate below ocelli (somewhat granular immediately below median ocellus), punctures contiguous, becoming larger and less dense near antennae. (51) Supraclypeal area extremely granulate; (52) uniformly but sparsely punctate, punctures separated by 3–4 times their width. (53) Clypeus granulate basally, obscurely granulate over apical two-thirds; (54) punctures minute basally, larger apically, uniformly separated by their width. (56) Mesoscutum dull; (57) punctation as in Figure 637, indistinctly doubly-punctate, smaller punctures very fine, inconspicuous, 2–4 times their width apart, larger punctures separated by 2–3 times their width laterally, becoming extremely sparse centrally. (58) Scutellum virtually impunctate adjacent to median line, punctures extremely fine and scattered. (63) Dorsal surface of propodeum (Figure 636) irregularly but distinctly striolate, striae reaching posterior margin; (64) surface very obscurely alveolated. (65) Metasomal tergum I dull, not noticeably granulate; (66) punctation very fine, obscure, moderately dense, punctures 1–2 times their width apart.

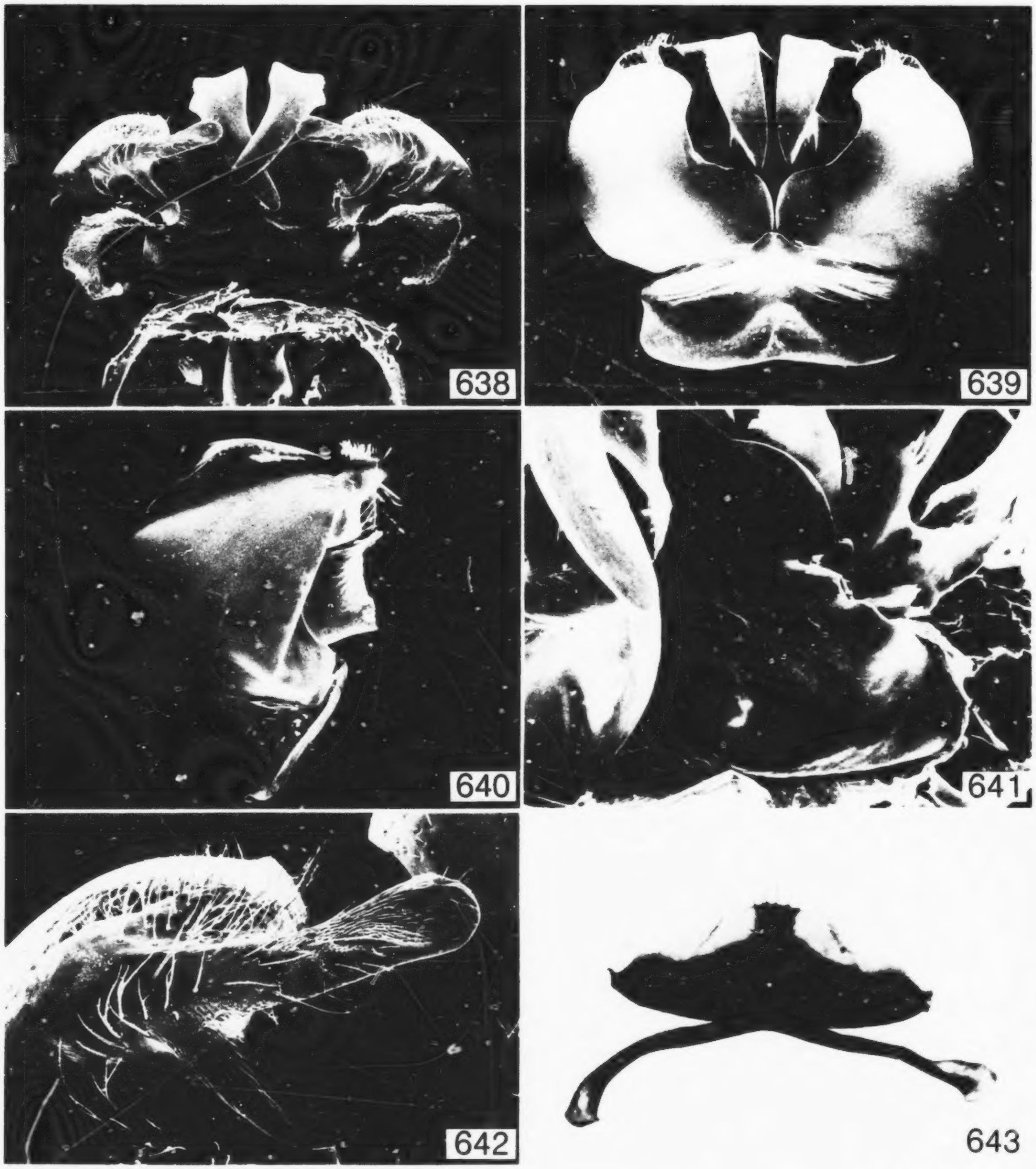
Coloration: (71) Wing membrane mostly hyaline, very obscurely infuscated towards apex.

Vestiture: (74) Pubescence of head pale yellowish brown. (75) Pubescence of thorax pale yellowish brown; (76) mesoscutal hairs somewhat dense, conspicuously plumose. (77) Hind tibial hairs concolorous, pale yellowish brown. (78) Anterior hairs of metasomal tergum I pale yellowish white, (79) basal hair bands of terga II–IV grayish white. (80) Acarinarium absent, elongate hairs scattered over anterior surface of tergum I (mites cling to propodeal hairs).

MALE: Similar to female except as follows: (1) length 7.1–8.5 mm ($\bar{x}$ = 7.9, n = 15); (2) wing length 1.9–2.5 mm ($\bar{x}$ = 2.3, n = 15); (3) abdominal width 2.0–2.9 mm ($\bar{x}$ = 2.6, n = 15). (4) Head as in figure 633 (length/width ratio 0.79–0.91, $\bar{x}$ = 0.85, n = 15). (5) Gena slightly wider than eye, (6) rounded, not produced posteriorly. (10) Clypeal surface broadly rounded, not flattened or depressed. (23) Unlike most species, flagellomere 1 relatively long compared to flagellomere 2 (ratio 1:2 approximately 0.87). Labrum as in Figure 635; (24) distal process absent; (25) basal area rounded medially, not depressed; (26) basal lateral depressions very weakly developed. (30) Mandible short, just reaching opposing clypeal angle. (53) Clypeus polished; (54) punctation nearly uniform throughout, punctures separated by 1–2 times their width. (68) Clypeal maculation usually present, sometimes reduced or rarely absent. (69) Flagellum entirely dark or light brown ventrally and contrasting with dark dorsum. (72) Tarsi yellow, contrasting with dark tibiae.

Vestiture: Sternal vestiture as in Figure 198; (82) hairs on sternum IV moderately short, suberect, without noticeable pattern; (83) hairs on sternum V mostly short, inconspicuous except for small patch of erect hairs on lateral edge of sternum and characteristic fringe of short hairs along the posterior sternal edge.

Terminalia: Sterna VII–VIII as in Figure 643; (85) sternum VIII without median process. Genitalia as in Figures 638–642; (86) gonobase



FIGURES 638–643.—*Lasioglossum titusi*, male: 638, genitalia, ventral view; 639, same, dorsal view; 640, same, lateral view; 641, volsella; 642, gonostylus; 643, sterna VII–VIII.

moderately elongate; (87) gonostylus robust, broadly rounded to truncate apically, surface conspicuously concave as viewed ventrally; (89) retrorse membranous lobe very slender basally, expanding to moderately broad distal portion (unlike other species, inner margin of lobe with row of conspicuously large, plumose setae); (90) volsella broadly rounded laterally, lacking prominent lobe.

Flight Records (Figure 644).—Female *L. titusi* have been collected in every month; however, 74% of the specimens examined were collected from May to July. Female records from the southwest region peak in late May, whereas those from the northwest peak in late June. The two specimens collected in November and January were from Riverside County, California; the one specimen collected in December was from Yolo County in the Central Valley of California. Male records are most common from July to September but range from May to early November, with one male collected on 11 January 1926, by P.H. Timberlake in Riverside, California.

Flower Records.—*Lasioglossum titusi* is unusual among *Lasioglossum* species in showing some level of oligolectic behavior. This was first mentioned by Bohart and Youssef (1976), who stated that this species "collects pollen only from ligulate composites (unpublished)." Hurd, LaBerge, and Linsley (1980) reported this species as being a "casual polylege" of *Helianthus*. Of the 374 females examined in this study that had associated floral data, 312 (83%) were collected on composite flowers; 112 of these specimens were noted to have full or nearly full scopal pollen loads and 111 of them were taken on composites (one was taken from *Calochortus*). Although the relationship between floral label data and actual source of scopal pollen are tenuous without pollen analysis, the obvious trend in this case is highly supportive of Bohart and Youssef's claim for oligolecty.

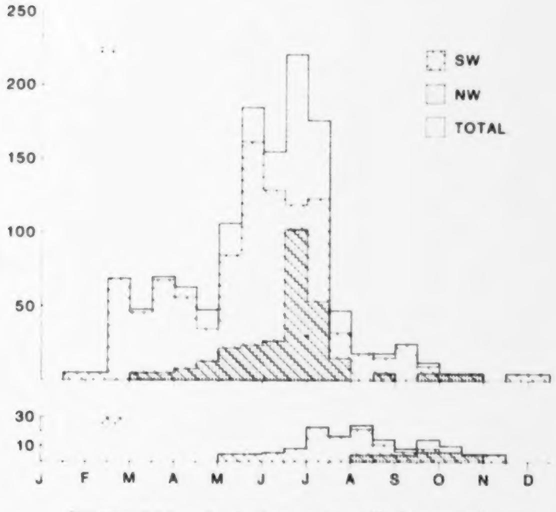


FIGURE 644.—*Lasioglossum titusi* flight records.

Summary: Females (365): Compositae 83%; Ranunculaceae 3%. Males (29): Compositae 93%; Plantaginaceae 7%. Total: 394 in 17 families, 53 genera as follows:

**Agoseris* 78(5)♀; *Anthemis* 3♀; **Aster* 6(1)♀, 1♂; *Astragalus* 1♀; *Baeria* 8♀; *Balsamorhiza* 1♀; **Blennosperma* 6(2)♀; *Blepharipappus* 15♀; *Brassica* 5♀; **Calochortus* 1(1)♀; *Calycadenia* 1♂; *Ceanothus* 1♀; *Chrysanthemum* 1♀; *Chrysothamnus* 1♀, 2♂; *Cichorium* 3♀; *Clarkia* 2♀; *Convolvulus* 1♀; *Coreopsis* 3♀; **Cosmos* 7(7)♀; **Crepis* 1(1)♀; *Cryptantha* 7♀; *Encelia* 4♀; *Fritillaria* 1♀; *Godetia* 1♀; *Grindelia* 6♀, 2♂; **Helianthus* 28(24)♀; **Hemizonia* 12(3)♀, 11♂; *Heterotheca* 1♀; *Hypericum* 1♀; **Hypochaeris* 56(37)♀; **Lasthenia* 9(4)♀; **Layia* 19(11)♀, 4♂; *Limnanthes* 1♀; *Lomatium* 1♀; **Madia* 7(5)♀, 1♂; *Malacothrix* 1♀; *Melilotus* 2♀; *Mentha* 1♀; *Mesembryanthemum* 1♀; *Nemophila* 2♀; *Parthenium* 21♀, 3♂; *Picris* 2♀, 1♂; *Plantago* 2♂; *Ranunculus* 15♀; *Salix* 1♀; *Sisymbrium* 1♀; **Solidago* 1(1)♀; *Stenotopsis* 1♀; *Stephanomeria* 1♀, 1♂; *Taraxacum* 13♀; *Trifolium* 1♀; *Triteleia* 1♀; **Wyethia* 2(1)♀.

Mite Associates.—Unlike other species of New World *Lasioglossum*, *L. titusi* is associated with a scutacarid mite, *Imparipes vulgaris* Delfinado and Baker (Linsley and MacSwain, 1959; Delfinado and Baker, 1976; Eickwort, 1979). See introductory section on "Mite Associations" for further details.

Specimens Examined.—1473 (1315♀, 158♂).

CANADA. British Columbia: Vernon 19 Sep 1903 (1♂; USNM).

MEXICO. Baja California Norte: Rio San Miguel, 22 Aug 1981, D.K. Faulkner (1♀; SDNHM).

UNITED STATES. California: *Alameda Co.; Butte Co.:* Biggs, 4 mi N; *Alpine Co.:* Monitor Pass Summit; *Amador Co.:* Fiddletown (4 mi E), Sutter Creek; *Calveras Co.:* Murphys. Railroad Flat; *Colusa Co.:* Bear Valley, Lodoga, 4 mi NW; *Contra Costa Co.; El Dorado Co.:* Shingle Springs; *Fresno Co.:* unspecified locality; *Humboldt Co.; Kings Co.:* Corcoran; *Lake Co.:* Lakeport, Lower Lake (11 mi W); *Lassen Co.:* Hallelujah Junction, Litchfield (10.6 mi N), Termo (6.5 mi N); *Los Angeles Co.; Madera Co.:* Bass Lake; *Marin Co.; Mariposa Co.:* Miami Ranger Station; *Mendocino Co.; Modoc Co.; Monterey Co.; Napa Co.; Orange Co.; Placer Co.:* Dutch Flat, Weimar (3 mi W); *Plumas Co.:* Meadow Valley, Quincy (4 mi W, 23 mi SW); *Riverside Co.; Sacramento Co.; San Francisco Co.; San Benito Co.:* Pinnacles, west side; *San Diego Co.:* La Jolla, San Diego, Warner Springs (2 mi N); *San Luis Obispo Co.:* Atascadero (8 mi W), Cambria Pines, Morro Bay, Pismo; *San Mateo Co.; Santa Barbara Co.:* includes San Miguel and Santa Rosa islands; *Santa Clara Co.; Santa Cruz Co.; Shasta Co.:* Redding; *Sierra Co.:* Gold Lake, Sattley; *Siskiyou Co.:* Weed; *Solano Co.:* Dixon (11 mi S), Vacaville (11 mi N), Vallejo; *Sonoma Co.; Stanislaus Co.:* Turlock; *Tulare Co.:* Ash Mountain; *Trinity Co.:* Hayfork; *Tuolumne Co.; Ventura Co.:* East Anacapa Island, Matilija; *Yolo Co.:* Davis, Putah Canyon, Woodland; *Yuba Co.:* Marysville.

COLORADO: *Delta Co.:* Paonia; *Routt Co.:* Craig (10 mi E), Steamboat Springs (11 mi NNW). IDAHO: *Bannock Co.:* Arimo (6 mi W); *Franklin Co.; Gem Co.:* Squaw Creek (10 mi E Emmett); *Latah Co.:* Juliaetta (3 mi SW), Troy; *Nez Perce Co.:* top of Lewiston Grade; *Oneida Co.:* Ireland Canyon, Salver Cow Camp; *Owyhee Co.:* Sheaville, 4 mi E. MONTANA: *Carbon Co.:* Roscoe (3 mi SSW); *Gallatin Co.:* Bozeman; *Judith Basin Co.:* Raynesford (8 km W). NEVADA: *Douglas Co.:* Topaz Lake; *Washoe Co.:* near Wadsworth. OREGON. *Baker Co.:* Sparta; *Benton Co.; Clackamas Co.:* Mt. Hood; *Columbia Co.:* Clatskanie, Scappoose; *Coos Co.:* Fairview (5 mi NE Coquille); *Crook Co.:* Prineville (25 mi E); *Curry Co.:* Gold Beach, Sixes River; *Deschutes Co.:* Three Sisters; *Douglas Co.; Harney Co.:* Burns (20 mi E), Frenchglen (9 mi E); *Jackson Co.; Josephine Co.:* Grave Creek; *Klamath Co.:* Dairy (10 mi E), Klamath Falls; *Lake Co.:* Warner Canyon; *Lane Co.:* Cottage Grove, Eugene; *Lincoln Co.:* Eddyville, Siletz; *Linn Co.:* Scio (12 mi E); *Marion Co.:* Salem, Woodburn; *Multnomah Co.:* Portland; *Polk Co.:* Kings Valley (2 mi N), Monmouth; *Tillamook Co.:* Oceanside, Tillamook Burn; *Umatilla Co.:* S. Pendleton, near Ukiah, Morrow-Umatilla Co. boundary on US 74; *Union Co.:* Minam Hill (10 mi E Elgin); *Wallowa Co.:* Florsa Lake; *Wasco Co.:* Mosier Creek; *Washington Co.:* Forest Grove, Hillsboro.

UTAH: *Box Elder Co.:* Mantua-Devil's Gate; *Cache Co.:* High Creek, Logan, Tony Grove Junction; *Salt Lake Co.:* Parleys Canyon, Salt Lake City; *Summit Co.:* Wanship. WASHINGTON: *Grays Harbor Co.:* Markham; *Island Co.:* Whidby Island (2 mi NE Oak Harbor); *Klickitat Co.:* Lyle (5 mi NE); *Pierce Co.:* Puyallup; *Thurston Co.:* Olympia; *Walla Walla Co.:* Walla Walla; *Whitman Co.:* Pullman. WYOMING: *Fremont Co.:* Lander; *Teton Co.:* Wilson (15 mi S).

42. *Lasioglossum transvorsum* (Vachal)

FIGURES 55, 645–658

Halictus transvorsus Vachal, 1904:472 [female].—Cockerell, 1905a:90 [key].

Lasioglossum transvorsum.—Moure and Hurd, 1986:65 [catalog].

TYPE MATERIAL.—Vachal based his description of *Halictus transvorsus* on two females labeled "Angang. Mex." without designating a holotype. Moure and Hurd (1986) state that "one of two females in the type series was labeled by one of us (Moure) in March, 1958 as the lectoholotype and is now so designated." Neither one of the specimens now has this lectotype label but one has been recently labeled "HOLOTYPE." I assume this specimen is the one Moure intended to be the lectotype and I have reattached a lectotype label with the designation attributed to Moure. The full label data are

Angag.[ueo?]; MUSEUM PARIS Amerique COLL. O. SICHEL 1867/HOLOTYPE [handwritten on red label]/Hal.[ictus] ♀ transvorsus Vach.[al] [handwritten by Vachal?]/Halictus transvorsus Vach. [al] [recently handwritten]/LECTOTYPE Halictus transvorsus Vachal des.[ignated by] Moure.

The lectotype and paralectotype are in the Paris Museum (MNHNP). The former specimen is in poor condition, having been repinned as evidenced by the very large hole in the mesoscutum (which is also cracked) and the two pin holes in the venter of the thorax. The last 9 flagellomeres of the left antenna are missing and the left forewing had been broken off and crudely reglued to the pleuron. During shipment in February 1984, the abdomen broke off; it is now contained in a small capsule attached to the insect pin.

The type-locality "Angang." refers to either Angangueo railway station [19°36′N, 100°17′W] or Mineral de Angangueo [19°37′N, 100°18′W]. This locality is apparently in the state of Michoacan.

DISTRIBUTION (Figure 645).—The known distribution of *Lasioglossum transvorsum* is confined

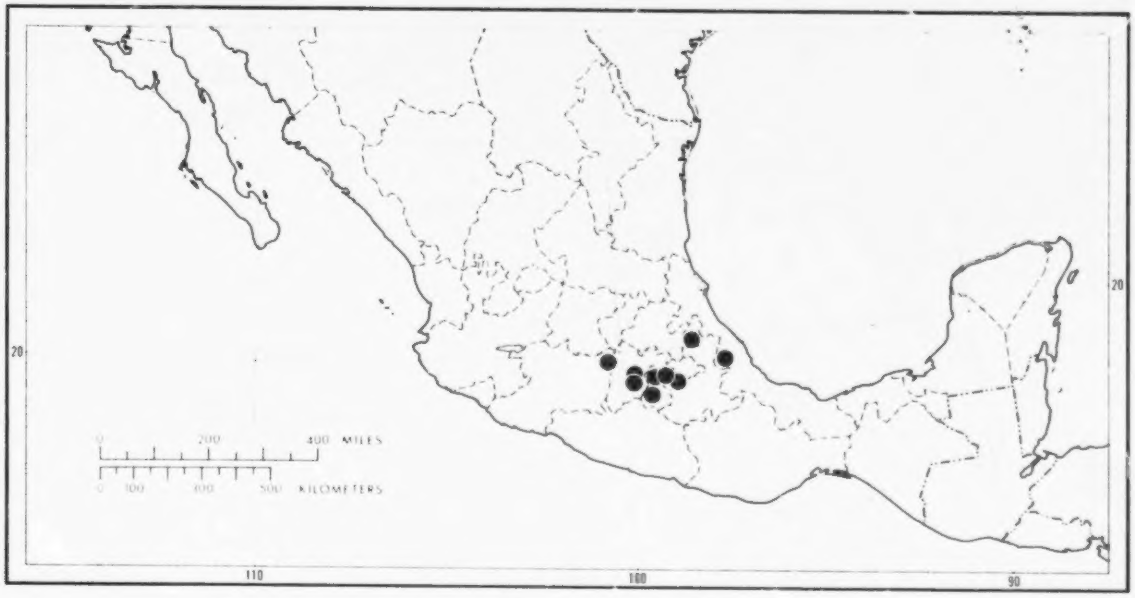


FIGURE 645.—Distribution of *Lasioglossum transvorsum*.

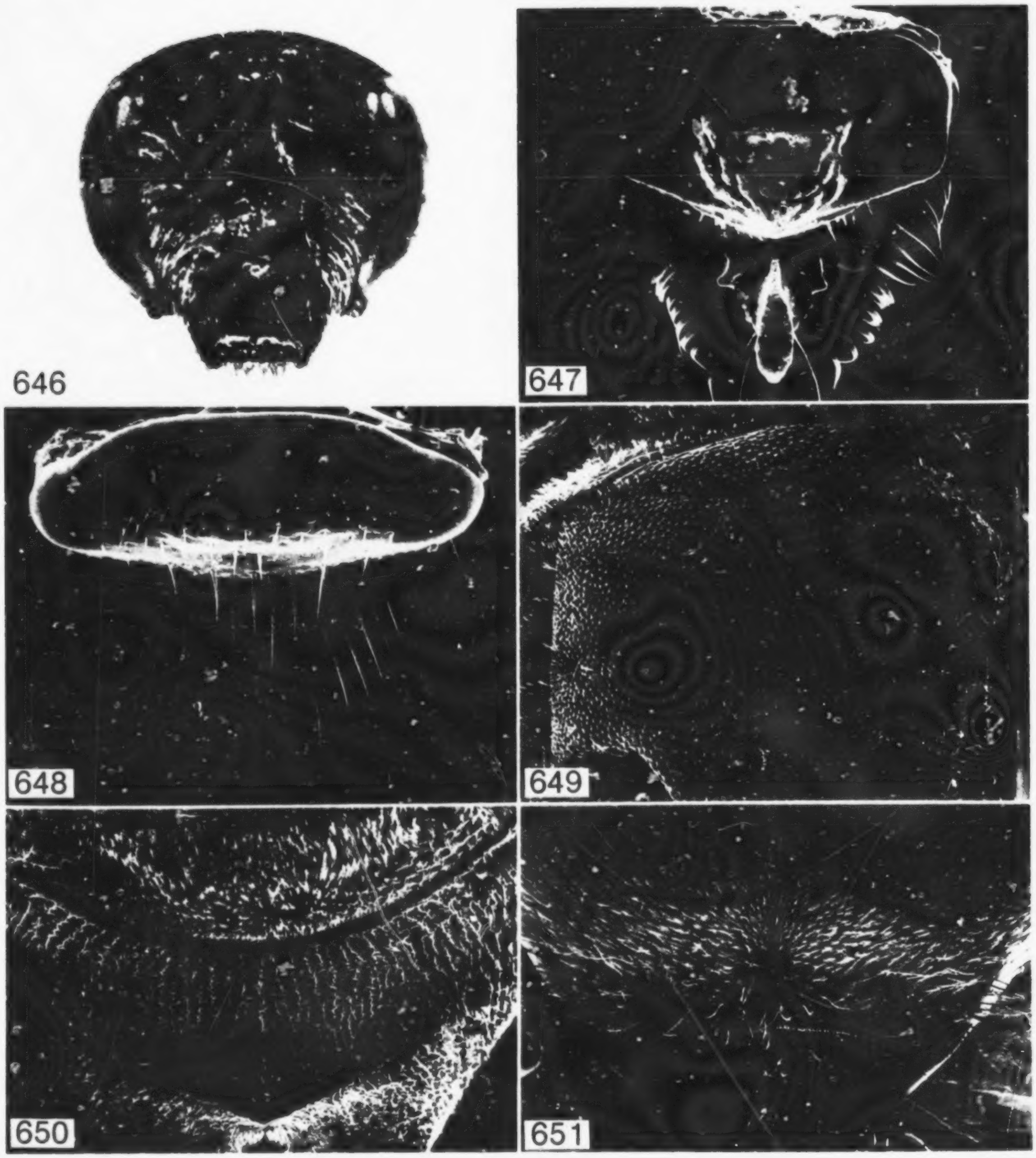
to a restricted area of southcentral Mexico near Mexico City. Only 38 females and 6 males have been collected.

DIAGNOSIS.—Both sexes of *L. transvorsum* can be recognized by the non-elevated mesoscutal anterior edge (Figure 87; compare with the normally elevated mesoscutal edge in Figure 90). The only other *Lasioglossum* having a non-elevated mesoscutum is *L. coriaceum* from the eastern United States. Aside from the great difference in distributions, *L. transvorsum* differs from *L. coriaceum* in having a densely punctate mesoscutum (Figures 649, 359) and in lacking a metasomal acarinarium (Figures 651, 72).

The dorsal propodeal surface of both sexes is diagnostic in having a strongly elevated V-shaped posterior rim (Figure 650). *Lasioglossum pallicorne* also has an elevated propodeal rim; however, it is more strongly developed than that of *L. transvorsum* and encloses a relatively smooth propodeal surface (Figure 574; the propodeal surface of *L. transvorsum* is striolate throughout). Furthermore, these two species differ in that *L. transvorsum* lacks an acarinarium, which is present in *L. pallicorne*. Also helpful in identifying *L. transvorsum* is the nearly complete pronotal lateral carina, which is only minutely notched (Figure 11). Females are unique in having a conspicuous patch of short adpressed hairs on the anterior surface of tergum I (Figure 651).

DESCRIPTION.—FEMALE: (1) Length 8.3–10.9 mm ($\bar{x} = 9.6$, $n = 15$); (2) wing length 2.6–3.0 mm ($\bar{x} = 2.8$, $n = 15$); (3) abdominal width 2.5–3.0 mm ($\bar{x} = 2.8$, $n = 15$).

Structure: (4) Head elongate (Figure 646; length/width ratio 0.92–1.0, $\bar{x} = 0.95$, $n = 15$). (7) Supraclypeal area evenly rounded, (8) moderately protuberant. (9) Clypeus projecting approximately 0.80 of it length below lower margin of eyes; (11) surface without median longitudinal sulcation. (14) Distance between lateral ocelli slightly exceeded by distance between lateral ocellus and eye. (23) Flagellomere 1 subequal to 2 in length along dorsal surface. Labrum as in Figure 647; (27) distal keel broad in frontal view, spoon-shaped; (28) distal lateral projections small



FIGURES 646–651.—*Lasioglossum transversum:* 646, female head; 647, female labrum; 648, male labrum; 649, female mesoscutum; 650, female propodeum; 651, base of female tergum I showing adpressed, short hair patch.

but distinct, somewhat conical; (29) fimbrial setae acutely pointed.

(32) Pronotal lateral angle narrowly obtuse; (33) pronotal lateral ridge complete, conspicuously elevated, oblique lateral sulcus poorly defined, extremely broad; (34) lower portion of lateral ridge sharply edged near oblique sulcus, becoming narrowly rounded ventrally. (35) Mesoscutal lip rounded, not bilobed, (36) not elevated from pronotum. (40) Dorsal surface of propodeum about 0.83 the length of scutellum and about 1.4 times the length of metanotum, (41) distinctly depressed centrally, (42) posterior margin broadly rounded with conspicuous median V-shaped projection; (43) propodeal triangle well defined medially by V-shaped elevation with conspicuous lateral rims, fading towards metanotum; (44) lateral carinae extending beyond midpoint of posterior surface, obscurely reaching dorsal surface. (45) Tibial spur as in Figure 55.

(46) Lateral edge of metasomal tergum II weakly sinuate.

Sculpture: (47) Face shiny, (48) densely and uniformly punctate between ocelli and antennae, punctures contiguous. (51) Supraclypeal area moderately granulate; (52) punctures separated by their width laterally, becoming only slightly less dense centrally. (53) Clypeus granulate basally, apical two-thirds moderately polished; (54) punctures obscure basally, separated by less than their width, separated by their width centrally, apical edge largely impunctate. (56) Mesoscutum shiny; (57) punctation as in Figure 649, punctures somewhat coarse, contiguous throughout. (58) Scutellar punctation moderately sparse adjacent to median line, punctures 1–2 times their width apart. (63) Dorsal surface of propodeum (Figure 650) very strongly ruguloso-striolate, median striae not quite reaching posterior margin; (64) surface alveolated. (65) Metasomal tergum I moderately shiny; (66) punctation fine, extremely dense, punctures nearly contiguous.

Coloration: (71) Wing membrane pale yellowish brown with infuscated spot near apex.

Vestiture: (74) Pubescence of head pale yellowish brown. (75) Pubescence of thorax mostly pale yellowish brown, white on pronotal lateral angle, pronotal lobe, metanotum and propodeum; (76) mesoscutal hairs moderately dense and plumose. (77) Hind tibial hair color differentiated, ventral and lateral hairs white, dorsal hairs brown to dark brown. (78) Anterior hairs of metasomal tergum I white, (79) basal hair bands of terga II–IV yellowish white. (80) Acarinarium absent, but tergum I with unique dense patch of short, fine, adpressed hairs on anterior edge (Figure 651).

MALE: Similar to female except as follows: (1) length 7.3–10.1 mm ($\bar{x} = 8.8$, $n = 5$); (2) wing length 2.3–2.7 mm ($\bar{x} = 2.5$, $n = 6$); (3) abdominal width 2.0–2.6 mm ($\bar{x} = 2.3$, $n = 5$). (4) Head elongate (length/width ratio 0.96–1.04, $\bar{x} = 1.0$, $n = 6$). (5) Gena slightly wider than eye, (6) moderately produced posteriorly. (10) Clypeal surface shallowly depressed ventrally. (23) Unlike most species, flagellomere 1 relatively long compared to flagellomere 2 (ratio 1:2 approximately 0.91). Labrum as in Figure 648; (24) distal process virtually absent; (25) basal area very weakly depressed medially, nearly rounded; (26) basal lateral depressions absent. (30) Mandible short, just reaching opposing clypeal angle. (53) Clypeus granulate, shiny; (54) punctures well formed, nearly contiguous basally, larger and scattered over apical two-thirds. (68) Clypeal maculation present. (69) Flagellum entirely dark. (72) Tarsi dark, concolorous with tibiae.

Vestiture: Sternal vestiture as in Figure 652; (82) hairs on sternum IV moderately elongate, suberect, posterior edge of sternum with noticeable fringe of pale hairs; (83) hairs on sternum V short, suberect, posterior sternal edge with broadly rounded, widely separated lateral hair lobes (similar to those of *L. heterorhinum*, Figure 464).

Terminalia: Sterna VII–VIII as in Figure 658; (85) sternum VIII with moderately broad, apically truncate, semicircular median process. Genitalia as in Figures 653–657; (86) gonobase elongate; (87) gonostylus moderately elongate, slender, narrowly rounded apically; (89) retrorse membranous lobe moderately broad (unlike

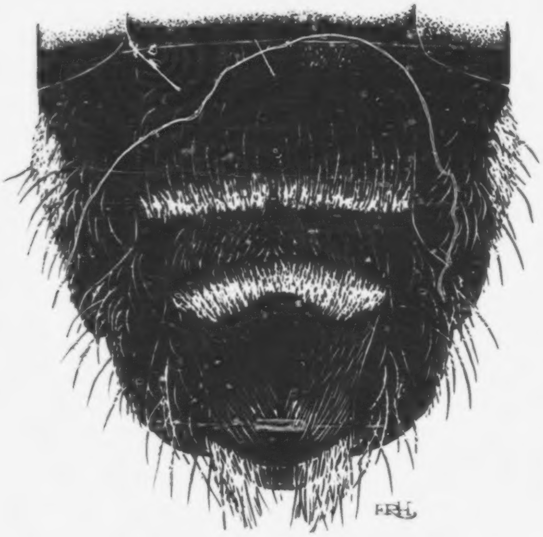


FIGURE 652.—*Lasioglossum transvorsum*, male sternal vestiture.

other species except *L. asaphes*, apex of gonocoxite near base of retrorse lobe with large, medially directed membranous lobe); (90) volsella lacking prominent lateral lobe.

FLIGHT RECORDS.—Because of the paucity of specimens, little can be said about the flight-activity patterns of *L. transvorsum*. Females have been collected in most months of the year, whereas males have been taken in January, April, July, and December.

FLOWER RECORDS.—Two females from the state of Mexico (Amecameca) were taken from *Heterotheca chrysopsidis*.

MITE ASSOCIATES.—*Lasioglossum transvorsum* females do not have an acarinarium, and none of the 38 females examined carried mites. However, one male from Morelos (Tres Cumbres, 3 mi S) had many hypopodes on the abdominal sterna, several on the hind femora, one each on the middle femora, one of the pronotum, and a few on the genae. Such a scattered positioning of hypopodes is not found in *Lasioglossum* males normally associated with mites. The positioning of mites on the abdominal sterna was not seen in any other male in this study.

SPECIMENS EXAMINED.—42 (37♀, 5♂).

MEXICO. DISTRITO FEDERAL: Mexico City, 18 mi S, 14 Sep 1957, 9000 ft, H.A. Scullen (1♀; OrS). MEXICO: Amecameca, 2 Jul 1961, 7950 ft, Univ. Kansas Mex. Exped. (2♀; KU); Agua Bendita, 2 Aug 1962, 9700 ft, H.E. Evans (1♀; MCZ); Mexico City, 50 km E, 29 Dec 1949, L.D. Beamer (1♀; KU); Real de Arriba, Temescaltepec, 7 Jun 1933, H.E. Hinton, R.L. Usinger (1♀; CAS); Rio Frio, 3 mi W, 30 Jun 1961, 9850 ft, Univ. Kansas Mex. Exped. (1♂; KU); Toluca, 16 mi E, 31 Jul 1962, 9500 ft, Univ. Kansas Mex. Exped. (2♀; KU), 9 mi E, 23 Jun 1963, 9600 ft, Scullen and Bolinger (3♀; OrS), 15.5 mi E, 6 Aug 1963, Byers and Naumann (1♀; KU). MICHOACAN: Cerro Tancitaro, 7 Jul 1941, 7800 ft, H. Hoogstraal (1♀; AMNH); San Juan Parangaricutiro, 24 Jun 1947, T.H. Hubbell (1♀; UMMZ). MORELOS: Cuernavaca, 15 km N, 6 Jun 1951, H.E. Evans (1♂; KU), 3 Jul 1951, P.D. Hurd (3♀; UCB), 6 mi N, 15 Aug 1954, 7500 ft, J.G. Chillcott (2♀; CNC), 10 mi N, 4 Apr 1959, 9000 ft, H.E. Evans (1♀, 1♂; CU); Tres Cumbres, 3 mi S, 16 Jan 1966, Breedlove, Gregory, Raven (11♀, 2♂; CU). PUEBLA: Huauchinango, 14 mi W, 17 Jun 1951, P.D. Hurd (2♀; UCB), 8 mi W, 23 Aug 1962, 6450 ft, Univ. Kansas Mex. Exped. (1♀; KU); Puebla, 40 mi W, 7 Sep 1957, 9200 ft, H.A. Scullen (1♀; OrS); Zacatlan, 20.7 mi NW, 22 Aug 1962, 7950 ft, Univ. Kansas Mex. Exped. (1♀; KU). VERACRUZ: Las Vigas, 6 mi E, 28–29 Jan 1968, Goodwin (1♀; USNM).

43. *Lasioglossum tricnicos* (Vachal)

FIGURES 56, 659–667

Halictus tricnicos Vachal, 1904:474 [female].—Cockerell, 1905a:90 [key].

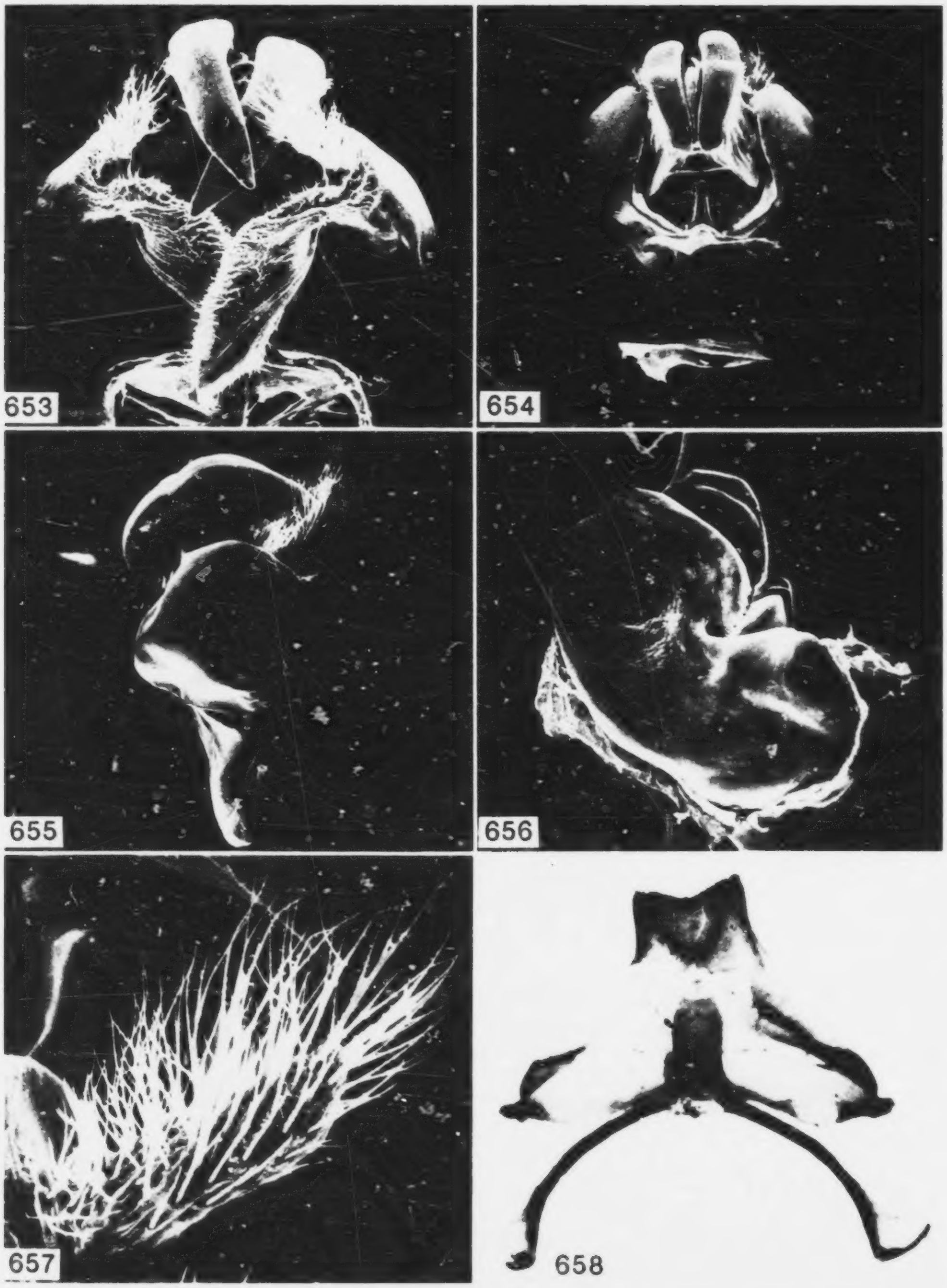
Lasioglossum tricnicos.—Moure and Hurd, 1986:66 [catalog].

TYPE MATERIAL.—The female holotype is labeled

Museum Paris Mexique coll. O. Sichel 1867/Sierra [illegible letter] Rivas [handwritten]/Mex[ico] [18]63 [illegible word, presumably the collector name] [handwritten]/Holotype [handwritten on red label]/tricnicos Vach[al] ♀ [handwritten] /Halictus tricnicos Vach.[al] [handwritten].

The specimen has an old pin-hole in the left pleuron but otherwise is in excellent condition. It is housed in the Paris Museum (MNHNP).

DISTRIBUTION (Figure 659).—*Lasioglossum tricnicos* is presently known from only five females and three males, which were collected in five south-central Mexican states: Distrito Federal, Mexico, Michoacan, Morelos and Tlaxcala.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FIGURES 653–658.—*Lasioglossum transvorsum*, male: 653, genitalia, ventral view; 654, same, dorsal view; 655, same, lateral view; 656, volsella; 657, gonostylus; 658, sterna VII–VIII.

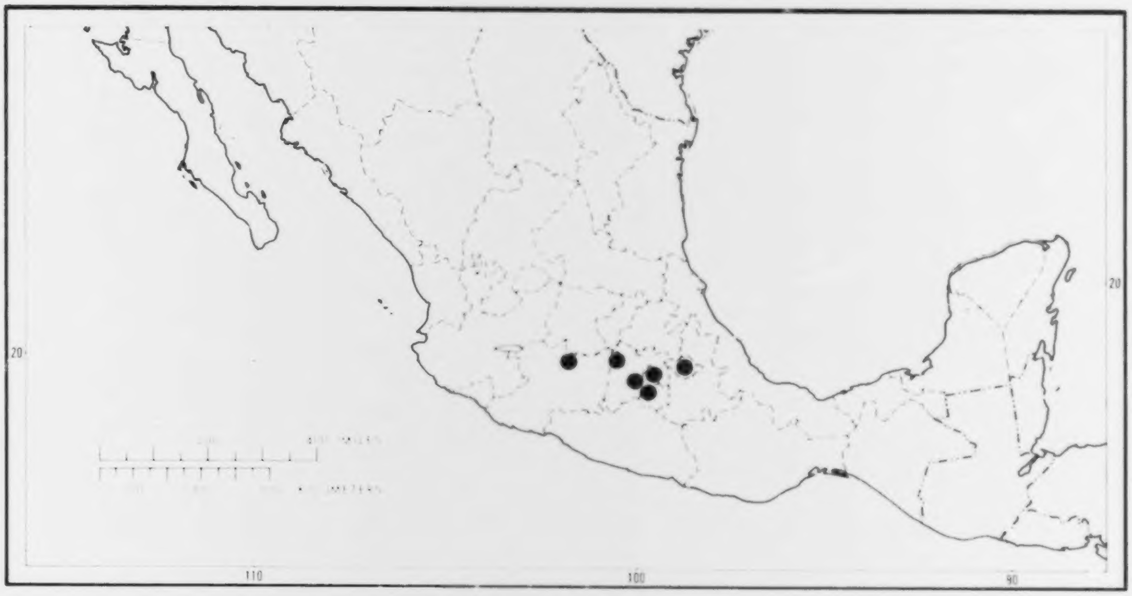


FIGURE 659.—Distribution of *Lasioglossum tricnicos*.

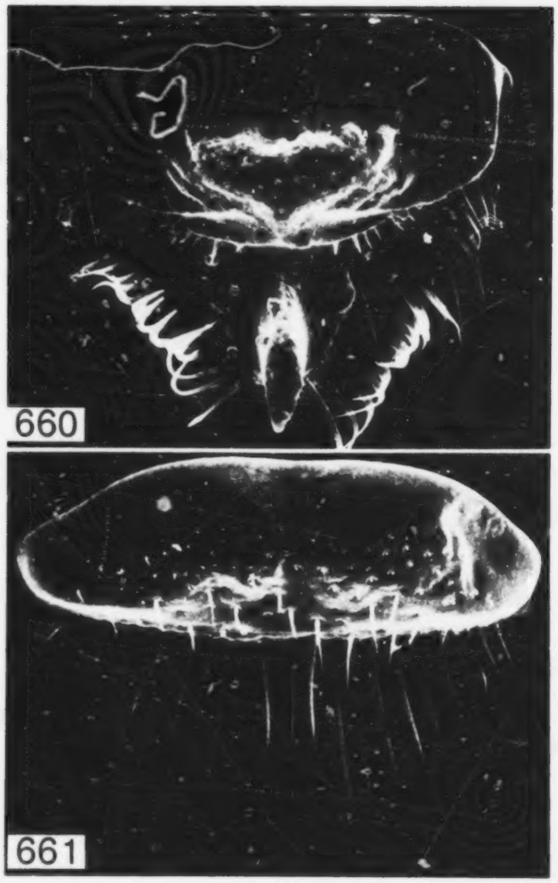
Two specimens were collected at elevations of 8500 and 9600 feet.

DIAGNOSIS.—*Lasioglossum tricnicos* can be recognized by the following character combination: posterior two-thirds of wing membrane hyaline, anterior third along costal margin heavily infuscated (as in Figure 177); mesoscutum very finely and completely granuloso-punctate (as in Figure 1); pronotal lateral angles densely covered with conspicuous white pubescence. The above characters will distinguish *L. tricnicos* from all other New World *Lasioglossum* except *L. crocoturum*, which is easily differentiated by having the metasomal terga IV–V nearly entirely covered by short, dense, adpressed hairs (Figure 1) and by having a relatively longer head than that of *L. tricnicos*. Other *Lasioglossum* having the anterior third of the wing membrane infuscated along the costal margin are *L. eickworti*, *L. sandrae*, and *L. katyae*, but these are conspicuously larger bees than *L. tricnicos* (body length 9.5–11.9 mm versus 8.4–9.0 mm) and generally occur south of the known distribution of *L. tricnicos* (Figure 395; only *L. sandrae* is known to be potentially sympatric with *L. tricnicos* and can be recognized by the conspicuous mat of short hairs covering the mesoscutum).

The infuscated anterior edge of the forewing and the erect, lateral hair tufts on sternum V (Figure 662) will distinguish the males of *L. tricnicos* from those of all other known *Lasioglossum*.

DESCRIPTION.—FEMALE: (1) Length 8.4–9.0 mm ($\bar{x}$ = 8.7, n = 3); (2) wing length 2.5–2.6 mm ($\bar{x}$ = 2.5, n = 3); (3) abdominal width 2.5 mm ($\bar{x}$ = 2.5, n = 3).

Structure: (4) Head short (similar to Figure 545; length/width ratio 0.87–0.89, $\bar{x}$ = 0.88, n = 3). (7) Supraclypeal area evenly rounded, (8) very weakly protuberant. (9) Clypeus projecting approximately 0.73 of its length below lower margin of eyes; (11) surface without median longitudinal sulcation. (13) Distance between lateral ocelli slightly exceeded by distance between lateral ocellus and eye. (23) Flagellomere 1 subequal to 2 in length along dorsal surface. Labrum as in Figure 660; (27) distal keel moderately broad in frontal view, lateral edges bowed; (28) distal lateral projections weakly developed,



FIGURES 660, 661.—*Lasioglossum tricnicos* labra: 660, female; 661, male.

rounded; (29) fimbrial setae acutely pointed.

(32) Pronotal lateral angle broadly obtuse; (33) pronotal lateral ridge incomplete, narrowly interrupted by oblique lateral sulcus; (34) lower portion of lateral ridge moderately edged. (35) Mesoscutal lip very weakly bilobed, (36) moderately elevated from pronotum. (40) Dorsal surface of propodeum about 0.75 the length of scutellum and about 1.4 times the length of metanotum, (41) slightly depressed centrally, (42) posterior margin broadly rounded; (43) propodeal triangle very weakly defined laterally, evident medially by low, rounded V-shaped elevation without lateral rims; (44) lateral carinae extending approximately two-thirds the length of posterior surface. (45) Tibial spur as in Figure 56.

(46) Lateral edge of metasomal tergum II very weakly sinuate.

Sculpture: (47) Face moderately shiny, (48) densely and uniformly punctate between ocelli and antennae, punctures contiguous. (51) Supraclypeal area extremely granulate; (52) uniformly and densely punctate, punctures separated by their width or less. (53) Clypeus granulate basally, apical two-thirds polished; (54) punctures separated by less than their width basally, less dense apically. (56) Mesoscutum moderately shiny; (57) punctation as in Figure 1, punctures extremely dense, granuloso-punctate throughout. (58) Scutellum uniformly granuloso-punctate. (63) Dorsal surface of propodeum weakly ruguloso-striolate laterally, striae becoming very obscure medially, almost ruguloso-granulate; (64) surface alveolated. (65) Metasomal tergum I moderately shiny; (66) granuloso-punctate throughout.

Coloration: (71) Posterior two-thirds of wing membrane mostly hyaline, anterior one-third along costal margin deeply infuscated.

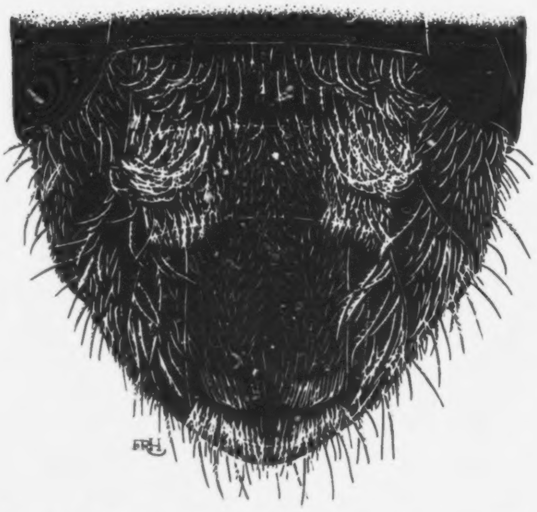
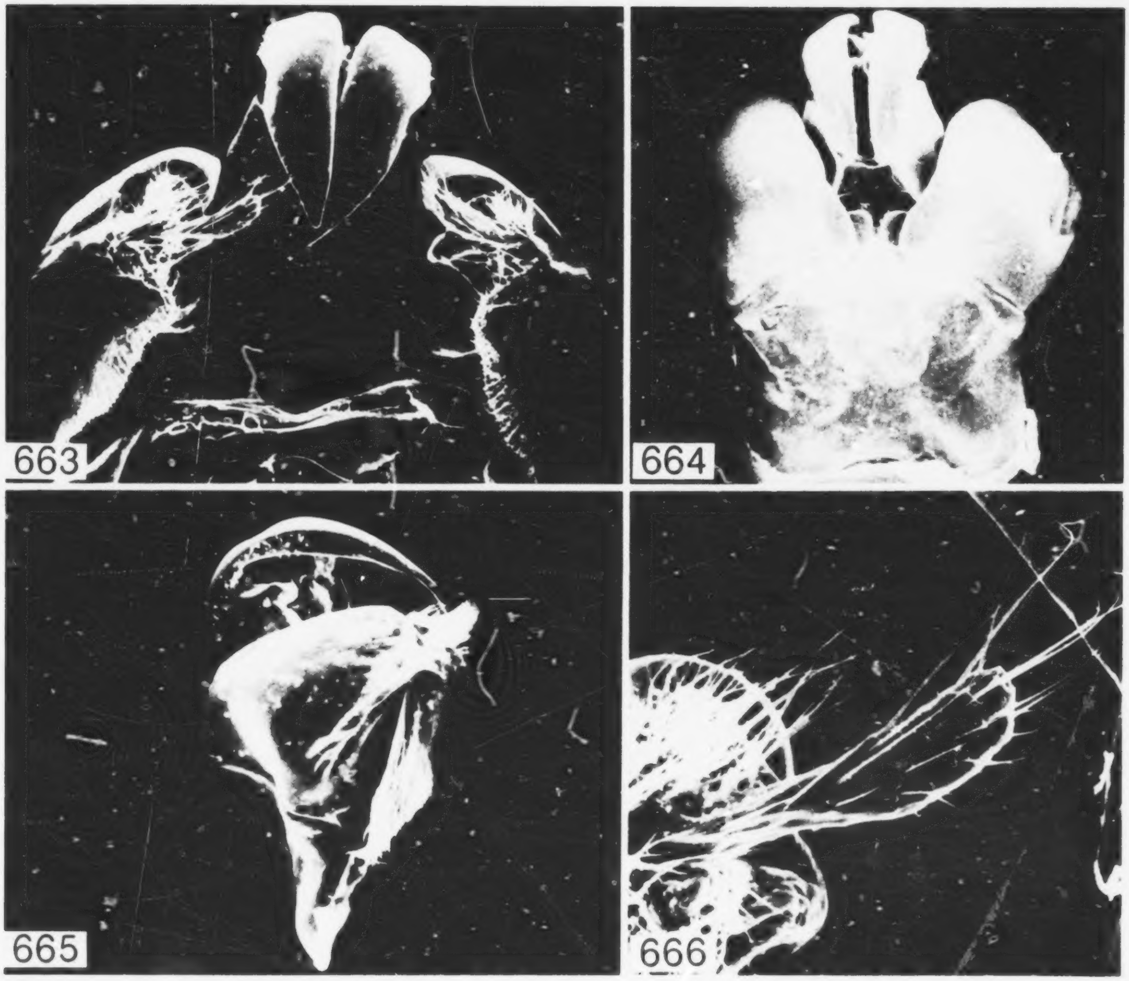


FIGURE 662.—*Lasioglossum tricnicos*, male sternal vestiture.



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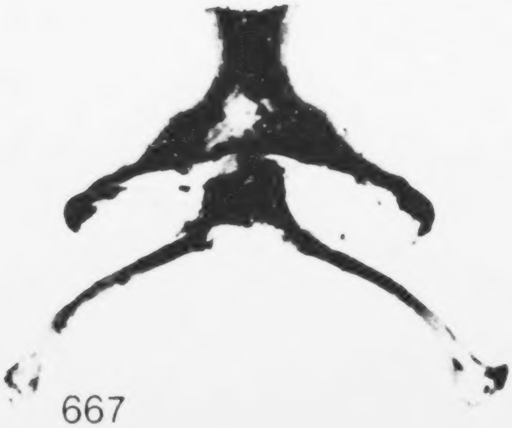

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FIGURES 663–667.—*Lasioglossum tricnicos*, male: 663, genitalia, ventral view; 664, same, dorsal view; 665, same, lateral view; 666, gonostylus; 667, sterna VII–VIII.

Vestiture: (74) Pubescence of head white to very light brown near antennae, becoming brown on vertex. (75) Pubescence of thorax white on pronotal lateral angle, pronotal lobes, metanotum and propodeum; hairs on pronotal lateral angle thick, conspicuous; (76) mesoscutal hairs moderately dense and plumose. (77) Hind tibial hair color differentiated, most hairs white, dorsal hairs brown to dark brown. (78) Anterior hairs of metasomal tergum I white, (79) basal hair bands of terga II–IV white to yellowish white. (80) Acarinarium absent, elongate hairs scattered over anterior surface of tergum I.

MALE: Similar to female except as follows: (1) length 7.8–8.1 mm ($\bar{x} = 8.0$, $n = 3$); (2) wing length 2.1–2.2 mm ($\bar{x} = 2.1$, $n = 3$); (3) abdominal width 1.8–2.0 mm ($\bar{x} = 1.9$, $n = 3$). (4) Head short (length/width ratio 0.90–1.0, $\bar{x} = 0.95$, $n = 3$). (5) Gena subequal to eye in width, (6) moderately produced posteriorly. (10) Clypeal surface broadly rounded, only faintly depressed along ventral edge. Labrum as in Figure 661; (24) distal process absent; (25) basal area depressed medially; (26) basal lateral depressions conspicuously developed. (30) Mandible short, just reaching opposing clypeal angle. (53) Clypeus granulate basally, apical two-thirds polished; (54) punctures well formed, nearly contiguous basally, apical two-thirds with scattered, moderately large punctures. (68) Clypeal maculation present. (69) Flagellum brown ventrally, slightly paler than dark dorsum. (72) Tarsi dark, concolorous with tibiae.

Vestiture: Sternal vestiture as in Figure 662; (82, 83) hairs on sterna IV and V short, suberect medially, becoming longer and erect laterally, forming noticeable elongate hair tufts.

Terminalia: Sterna VII–VIII as in Figure 667; (85) sternum VIII with moderately broad, apically truncate, semicircular median process. Genitalia as in Figures 663–666; (86) gonobase elongate; (87) gonostylus elongate, slender; (89) retrorse membranous lobe moderately broad; (90) volsella with prominent lateral lobes.

FLIGHT RECORDS.—One of the five known females of *L. tricnicos* was collected in June; the other female with flight data was collected in October. The three males were collected in June, July, and December.

FLOWER RECORDS.—One female taken from *Stylosanthes* (Leguminosae) in the state of Tlaxcala.

ADDITIONAL SPECIMENS EXAMINED.—7 (4♀, 3♂).

MEXICO. DISTRITO FEDERAL: Mexico City, 50 km E, 29 Dec 1949, L.D. Beamer (1♂; KU). MEXICO: El Oro City, summer 1924, P.W. Ayers (1♀; USNM); Toluca, 15.5 mi E, 6 Jul 1961, 9600 ft, Univ. Kansas Mex. Exped. (1♂; KU). MICHOACAN: Morelia (1♀; UCR). MORELOS: Cuernavaca, 22 Oct 1922, E.G. Smyth (1♀; USNM), 9 mi N, 27 Jun 1959, 8500 ft, H.E. & M.A. Evans (1♂; CU). TLAXCALA: Apizaco, 8 mi WNW, 18 Jun 1961, Univ. Kansas Mex. Exped. (1♀; KU).

THE *trizonatum* GROUP

SPECIES INCLUDED.—*Lasioglossum anhypops*, new species; *L. egregium* (Vachal); *L. mellipes* (Crawford); *L. trizonatum* (Cresson).

DISTRIBUTION (Figure 668).—The *trizonatum* group is very common throughout much of the western United States and southern Canada. The group ranges from Moresby Island off the coast of British Columbia, south to southern California, Arizona, and New Mexico. The species do not occur east of the 100th meridian, reaching central Colorado and the western edge of the Dakotas.

DIAGNOSIS.—Females of this group are rather nondescript and have commonly been confused with a variety of other *Lasioglossum* species. They are moderately large (body length $\bar{x} = 8.2$–9.7 mm) with elongate heads (Figures 670, 683, 697, 709; length/width ratio 0.93–1.02). The posterior margin of the dorsal propodeal surface is rounded (Figure 113; not broadly rounded, Figure 110; or truncate, Figure 127, as in most other species). The dorsal propodeal surface is noticeably elongate and ruguloso-striolate. *Lasioglossum colatum* has a similar propodeal surface but has a shorter head (Figure 339, length/width ratio 0.91) and distinctive short, adpressed hairs on the anterior surface of tergum I (Figure 351). The posterior margin of the dorsal propodeal surface is rounded and lacks the slightly

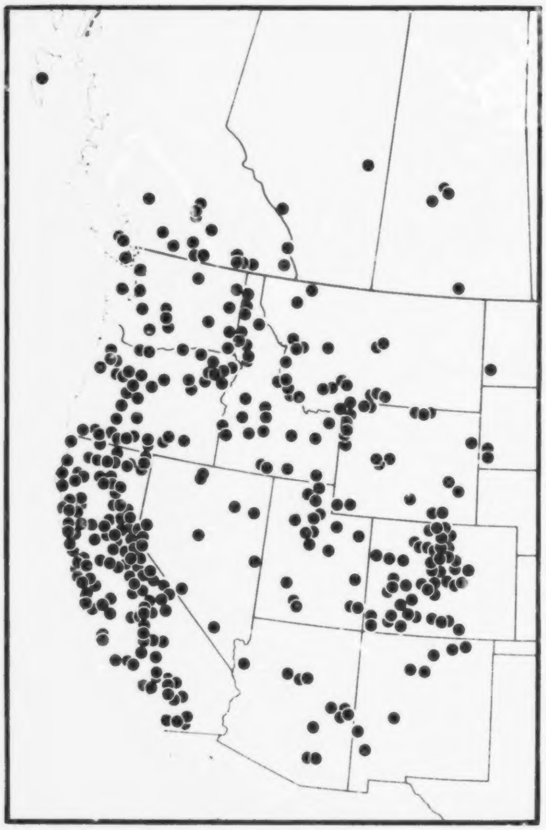


FIGURE 668.—Distribution of *Lasioglossum trizonatum* group.

elevated lateral rims that are found in females of the similar *forbesii* group (Figure 114). Most females of the *trizonatum* group have an acarinarium on the anterior surface of tergum I, the glabrous surface of which is relatively small and indistinctly delimited by relatively sparse, elongate fringe hairs (Figures 693, 711; the fringe hairs are dense and form a much more sharply defined border in the similar *forbesii* group, Figures 407–409, and *L. morrilli*, Figure 525). Females of *L. anhypops* lack an acarinarium (Figure 85) but can be recognized by the sharply excavated lateral edge of tergum II (Figures 154).

Among species occurring in the western United States, males of the *trizonatum* group can usually be recognized by their relatively flat clypeal surfaces and their conspicuously elongate heads, which appear longer than broad (Figures 684, 698, 710, length/width ratio $\bar{x} = 0.95-1.02$ for four species). The shortest heads are those of *L. anhypops* (Figure 671, length/width ratio $\bar{x} = 0.93$, $n = 15$). *Lasioglossum athabascense* males have moderately elongate heads (Figure 289, length/width ratio $\bar{x} = 0.95$) but have a broadly rounded clypeal surface and elongate, erect lateral hair tufts on sternum V (Figure 294; these tufts are similar to those of *L. egregium* where the head is obviously longer (Figure 684, length/width ratio $\bar{x} = 0.98$ and the clypeal surface flat). Other western species with moderately elongate headed males are *L. pavonotum*, which is metallic blue-green (Figure 585, length/width ratio $\bar{x} = 0.90$); *L. zonulum*, which has a unique vestiture pattern on sternum VI (Figure 744; length/width ratio $\bar{x} = 0.93$); *L. colatum*, which has an obviously rounded clypeal surface and shorter head (Figure 340, length/width ratio $\bar{x} = 0.90$); and *L. paraforbesii* (Figure 135, length/width ratio $\bar{x} = 0.93$), which has yellow hind tarsi and very short inconspicuous hairs on sternum V (*L. mellipes* hind tarsi yellowish orange and sternum V with erect, lateral hair tufts and/or a median rosette of erect hairs (Figures 701, 702). The males of *L. channelense*, long considered to be conspecific with *L. trizonatum*, have conspicuously elongate mandibles (Figure 320) and a virtually complete pronotal lateral carina (obviously incomplete in *trizonatum* males). The most similar male to those of the *trizonatum* group is that of *L. morrilli*. The latter species has a very elongate head (length/width ratio $\bar{x} = 0.95$) but can be distinguished by its virtually impunctate and rounded clypeal surface. Furthermore, the gonostylus of *L. morrilli* is truncate apically (Figure 233), which differs from the narrowly rounded gonostylus of *trizonatum* males (Figures 234).

DISCUSSION.—*Lasioglossum trizonatum* (Cresson, 1874), here considered a species group, has long been a source of confusion for bee taxonomists because of its extreme abundance and high levels of structural and color variability. Variation in leg color led J.C. Crawford in 1907 to recognize *L. mellipes* from cismontane southern California. This species has bright yellowish orange hind tarsi unlike the darkly pigmented legs of other *trizonatum* forms. However, this color difference appears to be clinal, with structurally similar specimens from Washington and Oregon having dark legs. As early as 1941, Cockerell stated that "Timberlake considers this [*L. mellipes*] a race of *H. trizonatus* Cresson." Another obvious source of variation is the head length of females with length/width ratios ranging from 0.88 to 1.04. Unfortunately, these differences in head length are often subtle and difficult to work with. Compounding the problem is that the genitalia of associated males appear to be identical and the type of *Halictus trizonatus* is apparently lost (Cresson, 1916, mentions that he could not find his own type).

Early in my studies I noticed that certain females from the Sierra Nevada of California, herein described as *L. anhypops*, were unique among *trizonatum* forms in lacking an acarinarium on the anterior surface of tergum I (Figure 85 vs. Figures 693, 711). Only 2.7% of the female *L. anhypops* examined carried mites, which sharply contrasts with the infestation levels of other forms (68.0% to 82.4%). Females of this species also have the lateral edge of tergum II conspicuously excavated (Figure 154). The shape of this tergal edge proved to be a useful character in delimiting other *trizonatum* forms. Females of *L. egregium* have a straight tergal edge (Figure 116); that of *L. mellipes* is evenly sinuate (Figure 117); and that of *L. trizonatum* sharply to moderately excavated (Figure 115).

Because of this structural and biological variation (association with mites) and apparent lack of intermediate forms, I have recognized one *trizonatum* form as a new species (*L. anhypops*) and have elevated one name from synonymy (*L. egregium*). As mentioned above, *L. anhypops* females are easily recognized by their lack of an acarinarium and the sharply excavated edge of tergum II. Many males of this species are unique in having darkly pigmented clypeal surfaces, lacking an apical yellow maculation. Not all specimens lack the clypeal maculation and these are best recognized by the very short, inconspicuous hairs on sternum V (Figure 676).

Lasioglossum egregium, described by Vachal from Washington state and British Columbia, is very distinctive in having the female tergal edge virtually straight (Figure 63). Males associated with this species are unique in having extremely elongate, erect lateral hair tufts on sternum V (Figure 687). These hairs on sternum V are subequal in length to those on sternum IV and together form a continuous, uninterrupted hair fringe (where erect lateral hair tufts occur in other *trizonatum* forms, the hairs on sternum V are noticeably shorter than those of the preceding segment).

Although the pale leg coloration fails as a diagnostic character for all *L. mellipes* females, the lateral edge of their tergum II is characteristically sinuate (Figure 61). Males of this species are unique among *trizonatum* males in having yellowish orange hind tarsi throughout their range. The vestiture on sternum V of these males is highly variable, superficially suggesting that two species are involved. One form, having elongate, erect lateral hair tufts on sternum V (Figure 701), is found from coastal northern California south to cismontane southern California. The other male form has relatively short hairs on sternum V and lacks lateral hair tufts, but has a conspicuous median rosette of erect hairs (Figure 702). This male is found in Washington, southern Oregon, and northern California through the Sierra Nevada. Where the two forms occur sympatrically along the central Californian coastline, a confusing array of apparent intermediate specimens is found. Because of this apparent intermediacy I am not recognizing two distinct species; however, this possibility should be considered in future studies. Most helpful for resolution of this problem would be the successful rearing of known nest mates of both sexes, especially from the San Francisco Bay area of California.

As previously mentioned, the type of *Halictus trizonatus* is apparently lost. Cresson's only mention of his original type material was "one specimen collected in Nevada by Dr. H.C. Yarrow." Occurring in most western states and especially abundant in Colorado are females with conspicuously elongate heads, acarinaria on the anterior surface of tergum I, and moderately to strongly excavated lateral edges of tergum II. In an effort to stabilize the use of the name *trizonatum*, I herein designate one of these females, also from Nevada, as the neotype of *H. trizonatus*.

As presently construed, *L. trizonatum* is highly variable; future work may show more than one species to be involved. Females have the lateral edge of tergum II sharply excavated (Figure 115) to only moderately but abruptly excavated. Whereas the heads of all *L. trizoaatum* females are conspicuously elongate, the heads of those females occurring in Mono County, California, are even longer (length/width ratio $\bar{x} = 1.02$, vs. 0.93–0.98 for all other females). Males associated with this species show comparable variation, most notably the presence or absence of antennal tyli (Figure 714). The males of *L. trizonatum* from Mono County usually have conspicuous tyli and very short, inconspicuous vestiture on sternum V. Many other males, occurring throughout the West, have tyli and moderately elongate, erect lateral hair tufts on sternum V. Finally, there are widespread males that lack tyli and have short sternal hairs similar to those of the Mono County males. So much variability among these forms occurs that they cannot be reliably and consistently separated at present. This variation obviously warrants further study (see species treatment of *L. trizonatum* for details and distribution of male forms).

As for the *forbesii* complex, the present treatment of the *trizonatum* species group must be considered to be preliminary. Most helpful would be biological studies in areas of sympatry and the rearing of males and females from the same nests.

44. *Lasioglossum anhypops*, new species

FIGURES 17, 85, 154, 669–681

TYPE MATERIAL.—The female holotype of *L. anhypops* is the property of the California Insect Survey, University of California, Berkeley, but is on loan deposit to the California Academy of Sciences in San Francisco. The specimen is in excellent condition and is labeled

Echo Lake El Dorado Co.[unty] Cal.[ifornia] VII[July]-9 1954/W.W. Middlekauff Collector/HOLOTYPE Lasioglossum anhypops R.J. McGinley [red label].

One hundred paratypes (73♀, 27♂)listed in the "Specimens Examined" section are designated.

ETYMOLOGY.—The specific epithet is a reference to the uniqueness of this species among members of the *trizonatum* group in being only rarely associated with phoretic mites (hypopodes).

DISTRIBUTION (Figure 669).—*Lasioglossum anhypops* occurs from southern British Columbia, including Vancouver Island, south through the Cascade Range of Oregon and through the Sierra Nevada to Los Angeles and San Bernardino counties in California. To the east, specimens have been taken in central Montana, Wyoming, and south to northern Utah. The occur-

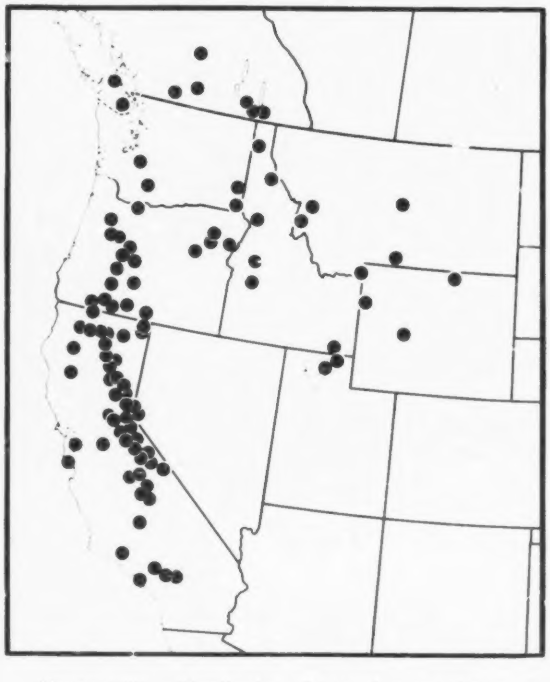


FIGURE 669.—Distribution of *Lasioglossum anhypops*.

rence of specimens in the San Francisco Bay area is unusual, but a few accurately determined specimens have been observed.

DIAGNOSIS.—The strongly, often sharply excavated lateral edge of tergum II (Figure 154) and the lack of an acarinarium on the anterior surface of tergum I (Figure 85) will distinguish females of *L. anhypops* from all other known species of *Lasioglossum*. Females of *L. trizonatum* have a similar tergal edge but have an acarinarium (Figure 711) and much longer heads (Figure 709, length/width ratio $\bar{x}$ = 0.97, n = 25 v. Figure 670, length/width ratio $\bar{x}$ = 0.93, n = 15). *Lasioglossum coriaceum* females also have a strongly excavated tergal edge but have an acarinarium (Figure 72) and occur only in eastern United States (Figure 353).

Many males of *L. anhypops* can be recognized by their flat clypeal surfaces, which lack an apical yellow maculation. In other species where the clypeus is entirely dark, the clypeal surface is broadly rounded (e.g., *L. pacificum, L. olympiae*). Males having the yellow clypeal maculation can be very difficult to diagnose, being best recognized by the very short, inconspicuous vestiture on sternum V (Figure 676).

DESCRIPTION.—FEMALE: (1) Length 8.2–10.1 mm ($\bar{x}$ = 9.0, n = 15); (2) wing length 2.3–2.8 mm ($\bar{x}$ = 2.6, n = 15); (3) abdominal width 2.5–3.0 mm ($\bar{x}$ = 2.8, n = 15).

Structure: (4) Head elongate (Figure 670; length/width ratio 0.88–1.0, $\bar{x}$ = 0.93, n = 15). (7) Supraclypeal area evenly rounded, (8) moderately protuberant. (9) Clypeus projecting approximately its full length below lower margin of eyes; (10) surface with obscure median longitudinal sulcation present in most specimens. (14) Distance between lateral ocelli subequal to distance between lateral ocellus and eye. (23) Flagellomere 1 subequal to 2 in length along dorsal surface. Labrum as in Figure 672; (27) distal keel moderately narrow, parallel-sided; (28) distal lateral projections well developed, triangular; (29) most fimbrial setae narrowly rounded apically, not sharply pointed.

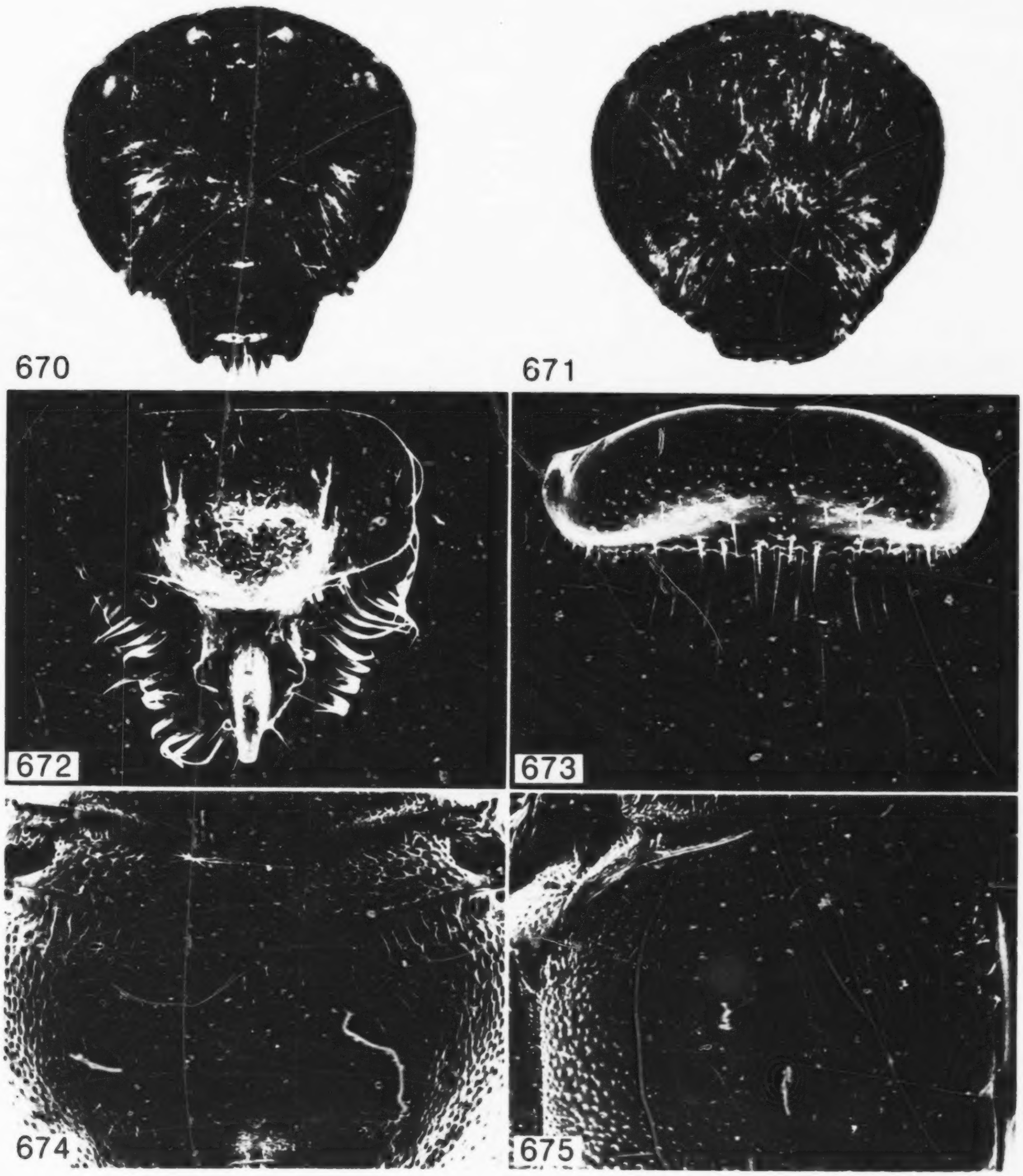
(32) Pronotal lateral angle narrowly obtuse; (33) pronotal lateral ridge incomplete, interrupted by oblique lateral sulcus; (34) lower portion of lateral ridge narrowly rounded. (35) Mesoscutal lip weakly bilobed, (36) moderately elevated from pronotum. (40) Dorsal surface of propodeum about 0.88 the length of scutellum and about 1.7 times the length of metanotum, (41) slightly depressed centrally, (42) posterior margin rounded; (43) propodeal triangle not defined laterally, evident medially as an inconspicuously V-shaped elevation without lateral rims; (44) lateral carinae extending at most to midpoint of posterior surface. (45) Tibial spur as in Figure 17.

(46) Lateral edge of metasomal tergum II strongly excavated, concave posteriorly, convex anteriorly with median area sharply angulated (Figure 154) or rounded (similar to Figure 115).

Sculpture: (47) Face shiny, (48) densely punctate below ocelli, punctures contiguous, becoming larger and less dense near antennae. (51) Supraclypeal area polished; (52) punctures separated by 1–2 times their width, becoming impunctate centrally. (53) Clypeus obscurely granulate basally, apical half polished; (54) punctures separated by their width or less basally, apical third sparsely punctate with large impunctate areas. (56) Mesoscutum moderately shiny; (57) punctation as in Figure 675, punctures separated by their width or less laterally and anteriorly, much less dense centrally, punctures 2–3 times their width apart. (58) Scutellum somewhat sparsely punctate adjacent to median line, punctures 1–2 times their width apart. (63) Dorsal surface of propodeum (Figure 674) striolate laterally becoming finely ruguloso-striolate medially, striae reaching posterior margin; (64) surface alveolated. (65) Metasomal tergum I moderately shiny; (66) punctation fine, dense, punctures slightly less than their width apart.

Coloration: (71) Wing membrane mostly hyaline, very obscurely pigmented in marginal cell.

Vestiture: (74) Pubescence of head yellowish white. (75) Pubescence of thorax yellowish white; (76) mesoscutal hairs moderately dense and plumose. (77) Hind tibial hairs concolorous, pale yellowish brown. (78) Anterior hairs of metasomal tergum I yellowish white, (79) basal hair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FIGURES 670–675.—*Lasioglossum anhypops:* 670, female head; 671, male head; 672, female labrum; 673, male labrum; 674, female propodeum; 675, female mesoscutum.

bands of terga II–IV white. (80) Acarinarium absent (Figure 85), elongate hairs scattered over anterior surface of tergum I.

MALE: Similar to female except as follows: (1) length 6.7–8.5 mm ($\bar{x}$ = 7.5, n = 15); (2) wing length 2.1–2.4 mm ($\bar{x}$ = 2.2, n = 15); (3) abdominal width 1.8–2.2 mm ($\bar{x}$ = 2.0, n = 15). (4) Head as in Figure 671 (length/width ratio 0.87–0.96, $\bar{x}$ = 0.93, n = 15). (5) Gena slightly wider than eye, (6) moderately produced posteriorly. (10) Clypeal surface shallowly depressed ventrally. Labrum as in Figure 673; (24) distal process absent; (25) basal area depressed medially; (26) basal lateral depressions absent. (30) Mandible short, just reaching opposing clypeal angle. (53) Clypeus polished; (54) punctures well formed and dense basally, very fine and scattered over apical two-thirds. (68) Clypeal maculation present or absent. (69) Flagellum entirely dark. (72) Tarsi dark, concolorous with tibiae.

Vestiture: Sternal vestiture as in Figure 676; (82) hairs on sternum IV moderately elongate, erect; (83) vestiture of sternum V mostly inconspicuous, with obscure median rosette of short hairs and small patch of moderately short, erect hairs near base.

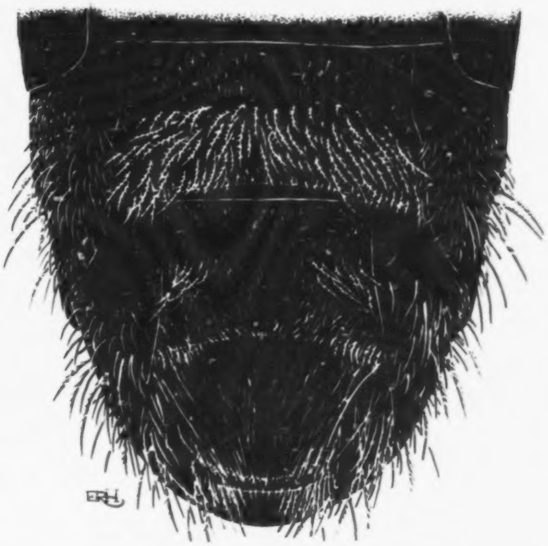


FIGURE 676.—*Lasioglossum anhypops*, male sternal vestiture.

Terminalia: Sterna VII–VIII similar to Figure 706; (85) sternum VIII with short, narrowly rounded median process. Genitalia as in Figures 677–680; (86) gonobase moderately elongate; (87) gonostylus moderately robust, narrowly rounded apically; (89) retrorse membranous lobe moderately slender; (90) volsella with prominent lateral lobe.

FLIGHT RECORDS (Figure 681).—Nearly all females of *L. anhypops* have been collected from May through October, with 82% of the records coming from June and July, with a peak in late June (northwestern records peak in early July). One female was taken in Lee Vining, Mono County, on 7 March 1933. The four female records from October were from San Bernardino and Shasta counties, California, and Whitman County, Washington. Males have been taken from July through September, with 56% of the records from August.

FLOWER RECORDS.—Females (77): Hydrophyllaceae 21%; Ericaceae 10%; Salicaceae 9%; Scrophulariaceae 9%. Males (64): Compositae 77%. Total: 141 in 21 families, 37 genera as follows:

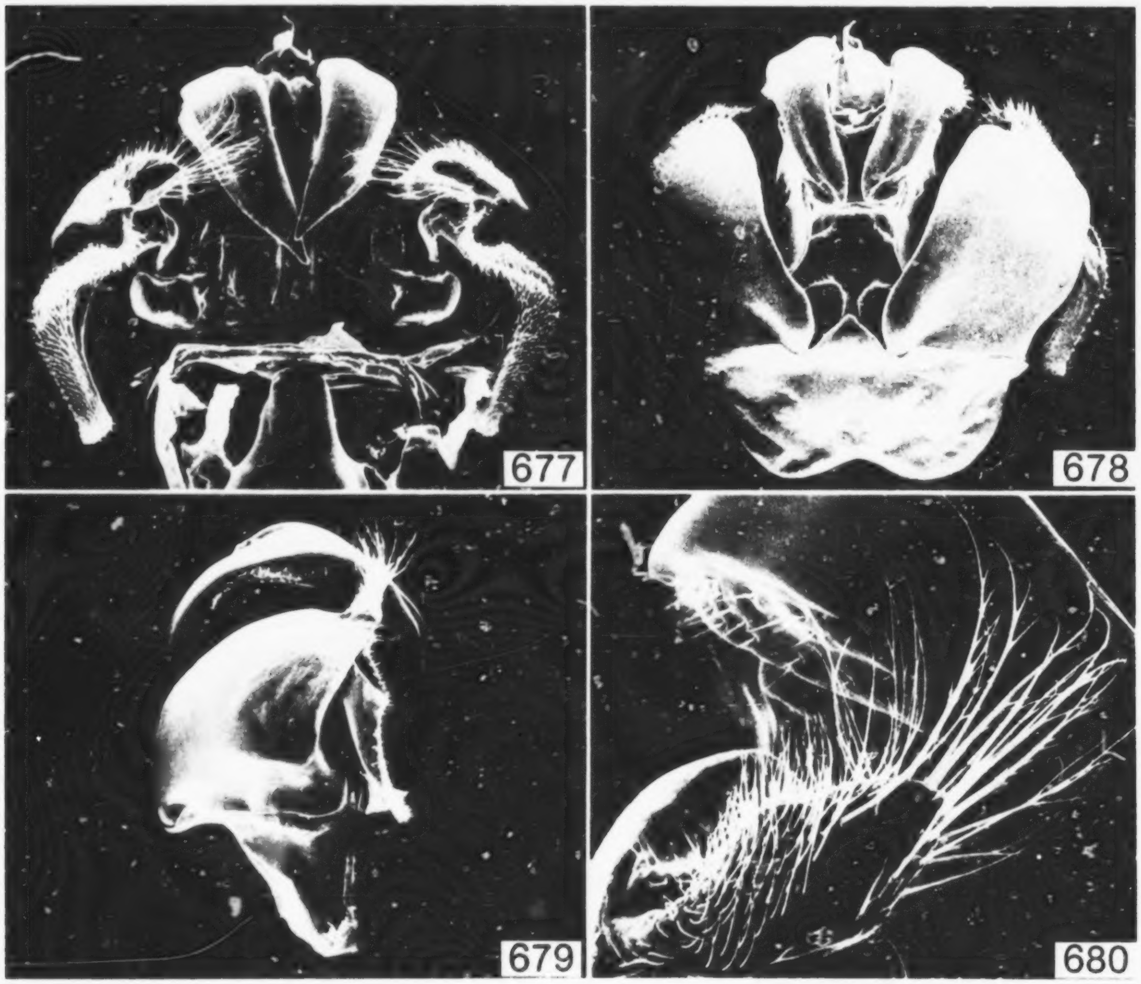
Achillae 1♀; *Agastache* 1♀; *Apocynum* 1♂; *Arctostaphylos* 8♀; *Aster* 2♀, 6♂; *Astragalus* 1♀; *Chrysopsis* 6♂; *Chrysothamnus* 1♀, 11♂; **Epilobium* 2♂; *Erigeron* 2♂; *Eriogonum* 2♀, 2♂; **Erysimum* 1(1)♀; *Geranium* 1♂; *Gutierrezia* 3♂; *Haplopappus* 3♂; *Helenium* 1♂; *Horkelia* 1♀; *Iris* 2♀; *Juniperus* 6♂; *Lonicera* 3♀; *Lupinus* 1♀; *Mentzelia* 1♂; *Montia* 2♀; **Pentstemon* 7(1)♀; **Phacelia* 16(11)♀; *Phlox* 2♀; *Polemonium* 1♀; *Pontentilla* 4♀, 7♂; *Prunus* 3♀; **Purshia* 1(1)♀; *Ranunculus* 1♀; **Ribes* 4(2)♀; *Rubus* 1♀; *Salix* 7♀; *Senecio* 2♂; *Solidago* 10♂; **Taraxacum* 1(1)♀.

MITE ASSOCIATES.—Although females of *L. anhypops* lack an acarinarium, a few females did have hypopodes on the anterior surface of tergum I. These amounted to only 15 out of 613 specimens examined, or 2.7%. The mites were attached to the tergal surface between the elongate hairs that cover tergum I. None of the 262 males of *L. anhypops* examined carried mites.

SPECIMENS EXAMINED.—Paratypes (73♀, 27♂).

CANADA. BRITISH COLUMBIA: Princeton, 4 mi W (Yale Region), VI-3-1957, E.I. Schlinger (1♀; UCD).

UNITED STATES. CALIFORNIA: *Alpine Co.:* Carson Pass,



FIGURES 677–680.—*Lasioglossum anhypops,* male: 677, genitalia, ventral view; 678, same, dorsal view; 679, same, lateral view; 680, gonostylus.

IX-11-38, M. Cazier (1♀, AMNH); Hope Valley, VII-9-48, one collected by P.D. Hurd, Jr., one by J.W. MacSwain (2♀, UCB); Winnemuca Lake, VII-14-64, M. Irwin (1♀; UCR). *El Dorado Co.:* Meyers, VII-11-1952, M.A. Gazier, W. Gertsch, R. Schrammel (1♀; AMNH); State Line, IX-1-1963, R.L. MacDonald (1♂; UCD). *Fresno Co.:* Kaiser Pass, VI-29-1961, G.I. Stage, R.R. Snelling (1♀; LACM). *Lassen Co.:* Bridge Cr.[eek] Camp, VII-9-49, W.H. Wade (1♀; UCB), VII-14-54, G. Schaefers (1♀; UCB); Hat L.[ake], Lassen Nat.[ional] Park, on *Salix,* VI-3-41, C.D. Michener (2♀; UCB); Susan R.[iver] Camp, VII-10-49, D. Cox (1♀; UCB). *Mono Co.:* Leavitt Meadows, VI-26-1937, ex. coll.[ection] M.A. Cazier (2♀; AMNH); Mammoth, Valentine R[a]nch Reserve Sagebrush Site, on *Purshia tridentata,* 25 Jun 1971, David Graves (1♀; CU); Rock Creek, VI-23-1937, ex. coll.[ection] M.A. Cazier (1♀; AMNH); Sonora Pass, VI-27-51, P.D. Ashlock (1♀; USNM), E side Sonora Pass, 9000′, VI-30-1961, J.G. Rozen (1♀; AMNH); Tom's Place, 1 mi W, two on *Chamaebatiaria millefolium,* VIII-13-54, D.D. Linsdale (3♂; UCB); W[est] Walker R[iver], on *Aster,* Vi-25-1937, C.D. Michener (1♀; KU).

Nevada Co.: Hobart Mills, 1 mi S, on *Chrysothamnus viscidiflorus* ssp. *typicus,* IX-1-57, E.G. Linsley (1♂; UCB); Sagehen, near Hobart Mills, VI-25-54, R.C. Blaylock (1♀; UCD), VI-25-1966, P.B. Schultz (2♀; UCD), VII-21-54, R.M. Bohart (1♀; UCD), VIII-26-52, R.F. Smith (1♂; UCB);

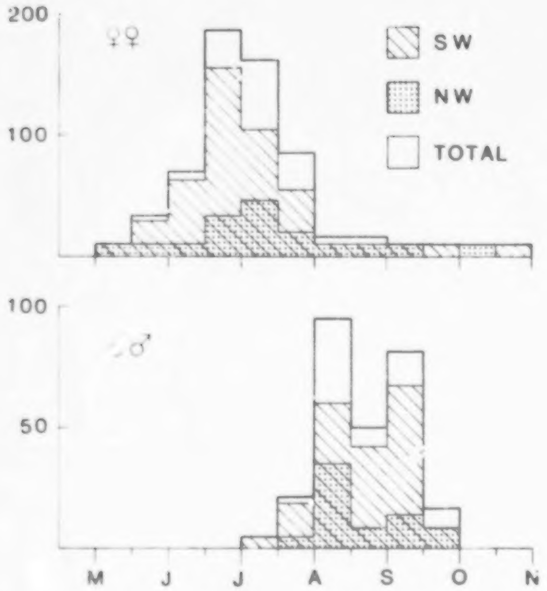


FIGURE 681.—*Lasioglossum anhypops* flight records.

Sagehen Creek, VI-25-1966, M.A. Chambers (1♀; UCD), VI-27-72, S.F. Casey (1♀; UCD), IX-5-1968, R.M. Bohart (1♂; UCD); Sagehen Creek, near Hobart Mills, VI-18-62, R.J. Gill (1♀; UCD), VI-23-62, E.J. Montgomery (1♀; UCD), VI-28-62, M.E. Irwin (2♀; UCD), VI-29-62, R.M. Bohart (1♀; UCD), VII-1-1964, M.E. Irwin (1♀; UCD), VII-5-62, M.E. Irwin (1♀; UCD); Truckee, 2 mi N, on *Haplopappus Bloomeri angustatus*, IX-5-57, E.G. Linsley (1♂; UCB), 4 mi N, on *Chrysothamnus viscidiflorus* ssp. *typicus*, IX-5-57, E.G. Linsley (1♂; UCB). *San Bernardino Co.:* Barton Flat (S. Fork Camp), 1, 2, 21, 24/9/44, A.L. Melander (4♂; UCR); Buff Lake, 7-28-57, J.R. Northern (1♀, LACM); Camp O-ongo (nr Running Springs, S.[an] Bdno.[Bernardino] Mts.), 8–12 Aug 1966, C.L. Hogue (2♂; LACM); Cedarpines, 1 mi W, on *Erysimum asperum*, V-26-66, J.C. Hall (1♀; UCR); Fawnskin, 28 Jul 1961, G.C. Eickwort (5♂; MSU EL), 29 Jul 1961, G.C. Eickwort (1♀; MSU EL); Lake Arrowhead, VIII-1-64, E.I. Schlinger (1♀; UCR); Sta.[Santa] Ana (S. Fork), 31 Jul 42, A.L. Melander (2♂, UCR), Sta.[Santa] Ana (S. Fks[Forks?]), 16/6/45 (1), 17/6/45 (1), 18/6/45 (2), 19/6/45 (1), A.L. Melander (5♀; UCR), Sta.[Santa] Ana Riv.[er]. (Up), 5-IX-53, A.L. Melander, A.L. Melander Collection (1♀; USNM), 16/9/48, A.L. Melander (1♂; UCR).

San Mateo Co.: Portola, Corn.[ell] Univ.[ersity] Exped.[ition], Lot 542, Sub, IX-5-1917, R.C. Shannon (1♀, CU). *Sierra Co.:* Independence, VII-20-54, R.C. Blaylock (1♀, UCD); Webber Lake, VII-2-59, J.M. Linsley (1♀; UCB); Yuba Pass, VII-8-1952, M. Cazier, W. Gertsch, R. Schrammel (1♀; AMNH). *Tuolumne Co.:* Strawberry, VI-21-1957, Donald L. Flaherty (1♀; UCR), VI-22-1957, W.T. Cotes (2♀, UCD), VI-2[illegible]7, S.M. Kappos (1♀, UCD), VIII-28-60, E. Jessen (1♂; UCB). *County not specified:* Carnelian Bay (Lake Tahoe), VI-24-51, R.C. Blaylock (1♀; UCD); Fish Camp, VII-14-1948, H.M.G. & D. Townes (1♀, KU); Lake Tahoe, 21-6-53, A.L. Melander, A.L. Melander collection (1♀; USNM); Porcupine Flat, Yo.[semite] P[ar]k, VIII-3-62, R. & K. Dreisbach (1♀; MSU EL); Riverton, VI-28-1961, M.E. Irwin (1♀; UCD); Yosemite Park, Glac.[ier] P[oin]t. Road, 1-VII-17, A.L. Melander (1♀; UCR). IDAHO: [*Franklin Co.:*] Giveout, 6700 ft alt., About 42°24'N, 111°10'W, F 1740, 7 Jul 1920 (1♀; AMNH).

MONTANA: *Carbon Co.:* E[ast] Rosebud Cyn.[Canyon], 5700', 30 Jun 1966, B. & C. Durden (1♀; AMNH). *Rav[alli] Co.:* Skalkaho Pass, 24 Jul 1949, C.B. Philip, McDermott (1♀; KU). OREGON: *Bonner Co.:* Sandpoint, VI-21-1955, R.M. Bohart (1♀; UCD). *Deschutes Co.:* Paulina Lake, elev.[ation] 6300 feet, 14 Jul 1962, R.W. Matthews (1), G.C. Eickwort (2), R.L. Fischer (1) (4♀; MSU EL); Sisters, VI-24-1954, J.C. Downey (1♀; UCD). *Hood River Co.:* Mt. Hood, 7-18-31, M.W. Sanderson (1♀, KU). *Lake Co.:* Middle Fork [of] Crooked Creek (Warner Mts.), VIII-3-1968, R.F. Denno, D.R. Miller (3♂; UCD); Silver Lake, 12 mi SW, 15 Jul 1962, G.C. Eickwort (1♀; MSU EL). *Lane Co.:* Oakridge, 10 mi NE, 15 Jul 1959, G.C. Kettunen (2♀; MSU EL). *Linn Co.:* Upper Soda, 6 mi E (Iron Mt). Elev.[ation] 5000 feet, 18 Jul 1962, G.C. Eickworth (1♀; MSU EL).

Additional localities recorded (775 specimens, 540♀, 235♂.

CANADA. BRITISH COLUMBIA: Bamberton Provincial Park (3 mi S Mill City, Vancouver Island), Creston, Fish Lake (Summerland), Fitzgerald, Oliver, Robson, Saanich, Salmon Arm, Vancouver Island, Victoria.

UNITED STATES. CALIFORNIA: *Alameda Co.:* Berkeley; *Alpine Co.; Calaveras Co.:* Camp Wolfboro, Dorrington, 8 mi NE; *Eldorado Co.; Fresno Co.; Inyo Co.:* Whitney Portal; *Kern Co.:* Mt. Pinos; *Lassen Co.; Los Angeles Co.:* Crystal Lake, San Gabriel Mts. (Blue Ridge); *Madera Co.:* meadow near locked gate on road to Mark Mine, SE slope Green Mt.; *Mariposa Co.:* Miami Ranger Station; *Modoc Co.; Mono Co.; Nevada Co.; Placer Co.; Plumas Co.; San Bernardino Co.; Santa Cruz Co.:* Bear Valley, Santa Cruz Mts., Big Basin; *Shasta Co.; Siskiyou Co.; Sierra Co.; Stanislaus Co.:* Evergreen Road, 3.2 mi W Hwy 120; *Tehama Co.:* Government Flat; *Trinity Co.:* Big Flat (Coffee Creek), Fawn Lodge; *Tulare Co.; Tuolumne Co.; Ventura Co.:* Mt. Pinos. IDAHO: *Boise Co.:* Bannock Creek (5 mi SE Idaho City); *Bonner Co.:* Sandpoint, 7–8 mi E; *Franklin Co.:* Cub River Canyon, Willow Flat; *Idaho Co.:* Grangeville (Moose Creek Ranger Station); *Shoshone Co.:* Avery, 4 mi N; *Valley Co.:* Cascade, 7.4 mi E.

MONTANA: *Carbon Co.: East Rosebud Lake; Fergus Co.:* Lewiston, 15 mi SSW; *Gallatin Co.:* West Yellowstone; *Granite Co.:* Clinton, 16 mi S. NEVADA. *Douglas Co.:* Carson City; *Washoe Co.:* Mt. Rose. OREGON. *Baker Co.:* Big Creek (26 mi SE Union), Cornucopia; *Boise Co.:* Garden Valley, 3 mi NE;

Deschutes Co.: Bend (10 mi W), Three Creeks Meadow (15 mi S Sisters); *Grant Co.:* Dixie Butte, Strawberry Mt.; *Harney Co.:* Antelope Butte; *Hood River Co.:* Government Camp, Mt. Hood (including Cloud Cap Inn, Cooper's Spur, Homestead Inn); *Jackson Co.:* Mt. Ashland; *Klamath Co; Marion Co.:* Silver Creek Park; *Union Co.:* Ladd Canyon (14 mi S La Grande), Union, 26 mi SE (Lower Lick Creek), 28 mi SE (Upper Lick Creek), 36 mi SE (Lower Goose Creek); *Wallowa Co.:* Tollgate, 20 mi N. UTAH. *Box Elder Co.:* Willard, Willard Peak; *Cache Co.:* Logan Canyon, Mantua (10 mi S), Tony Grove Canyon. WASHINGTON. *Asotin Co.:* Fields' Spring State Park; *Pierce Co.:* Mt. Rainier; *Whitman Co.:* Pullman. WYOMING. *Fremont Co.:* Lander, 11 mi S (Frye Lake), 28 mi SW (Louis Lake); *Lincoln Co.:* Smoot, 12 mi SE; *Sheridan Co.:* Mts. near Sheridan; *Teton Co.:* Jackson Hole, Jenny Lake.

45. *Lasioglossm egregium* (Vachal), new combination

FIGURES 31, 63, 682–694

Halictus egregius Vachal, 1904:476 [female].—Cockerell, 1905a:90 [key].—Crawford, 1906:303 [comparison to *H. trizonatus*].—Michener, 1951:1107 [synonymy with *L. trizonatum*].—Moure and Hurd, in press [lectotype designation].

TYPE MATERIAL.—The type material of *L. egregium* is deposited in the Naturhistorisches Museum, Vienna. Moure labeled one of Vachal's two females the lectotype in 1958 and has recently published this designation (Moure and Hurd, 1986). The lectotype is labeled

Brit.[ish] Columb[ia] Yale 189[year not indicated]/egregius det. J. Vachal [handwritten by Vachal?]/H.[alictus] ♀ egregius Vach[al] [handwritten by Vachal?]/Lectotype egregius ♀ Vach[al] det.[ermined by] J.S. Moure 1958 [handwritten by Moure].

The specimen is missing the right rear wing but is otherwise in excellent condition and clearly shows the diagnostic straight lateral edge of tergum II (Figure 63). I have attached a yellow paralectotype label to Vachal's other type specimen.

DISTRIBUTION (Figure 682).—*Lasioglossum egregium* has been collected in British Columbia, Alberta, Manitoba, and every American state west of the 104th meridian.

DIAGNOSIS.—Females of *L. egregium* can be recognized by the straight lateral edge of tergum II (Figure 63). Males have elongate heads (Figure 684, length/width ratio $\bar{x} = 0.98$, $n = 15$) and extremely elongate, erect lateral hair tufts on sternum V (Figure 687). The lateral hair tufts on sternum V are as long as those on the preceding segment and together form a continuous, uninterrupted hair fringe. Other males occurring in western United States and Canada that have erect lateral hair tufts on sternum V are *L. mellipes,* which have yellowish orange hind tarsi, certain *L. trizonatum* males that have antennal tyli (Figure 714) and noticeably shorter hairs on sternum V than on IV, and *L. athabascense,* which have a shorter head (Figure 289, length/width ratio $\bar{x} = 0.95$, $n = 20$) and a rounded clypeal surface (clypeal surface flat in *L. ergregium*).

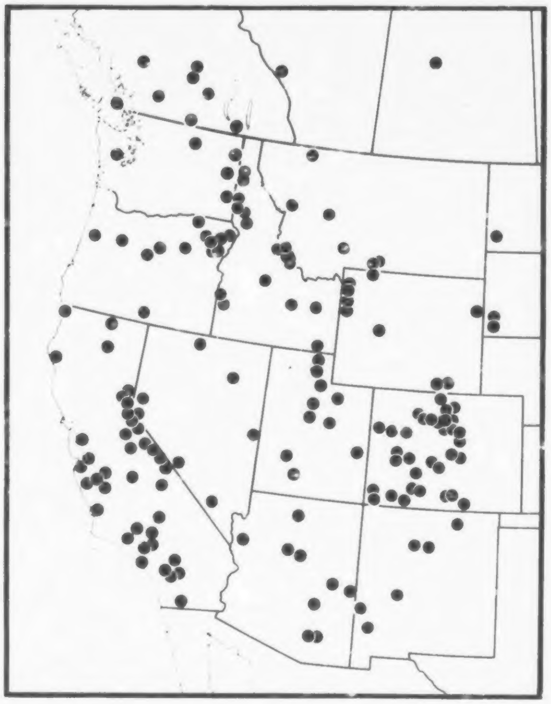


FIGURE 682.—Distribution of *Lasioglossum egregium*.

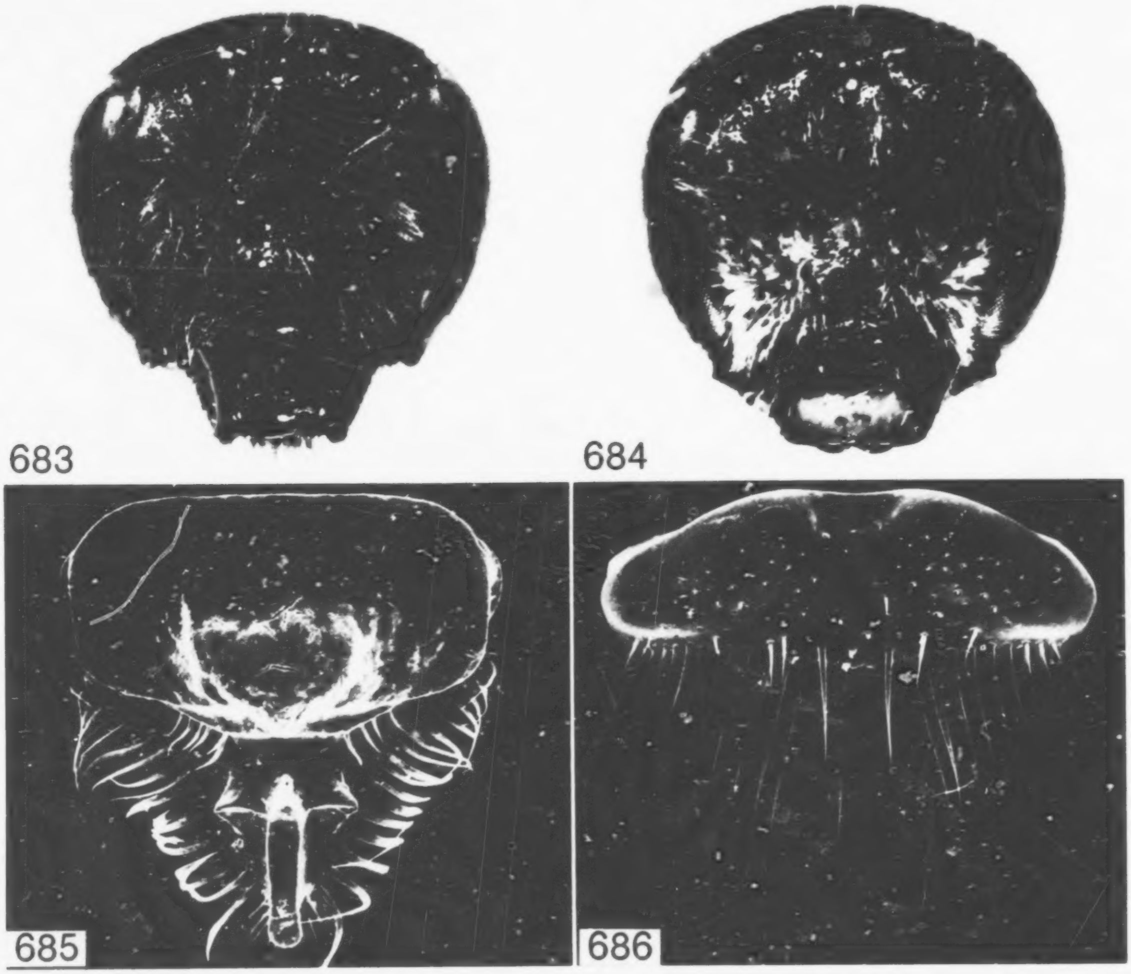
DESCRIPTION.—FEMALE: As described for *L. anhypops* except as follows: (1) Length 8.8–10.8

mm ($\bar{x}$ = 9.7, n = 15); (2) wing length 2.6–3.2 mm ($\bar{x}$ = 3.0, n = 15); (3) abdominal width 2.8–3.3 mm ($\bar{x}$ = 3.0, n = 15).

Structure: (4) Head elongate (Figure 683; length/width ratio 0.92–1.0, $\bar{x}$ = 0.96, n = 15). (9) Clypeus projecting approximately 0.88 of its length below lower margin of eyes.

(46) Lateral edge of metasomal tergum II virtually straight (Figure 63).

Vestiture: (75) Pubescence of thorax mostly yellowish white, white on pronotal lateral angle, pronotal lobe and metanotum. (80) Acarinarium present (Figure 693), a moderately large glabrous area at base of tergum I, surrounded laterally by elongate fringe hairs, which lack a sharply delimited border; acarinarial surface often with some scattered hairs; dorsal opening of acarinarium moderately wide, not sharply delimited, width slightly less than width of lateral hair fringe as seen in dorsal view.



FIGURES 683–686.—*Lasioglossum egregium:* 683, female head; 684, male head; 685, female labrum; 686, male labrum.

MALE: As described for *L. anhypops* except as follows: (1) length 7.2–9.8 mm ($\bar{x} = 7.9$, $n = 15$); (2) wing length 2.2–2.7 mm ($\bar{x} = 2.5$, $n = 15$); (3) abdominal width 1.8–27.7 mm ($\bar{x} = 2.1$, $n = 15$). (4) Head elongate (Figure 684); length/width ratio 0.92–1.0 ($\bar{x} = 0.98$, $n = 15$). (68) Clypeal maculation present.

Vestiture: Sternal vestiture as in Figure 687; (82) hairs on sternum IV erect, moderately elongate medially, gradually becoming longer laterally, forming conspicuous lateral erect hair tufts; (83) vestiture of sternum V similar to that of sternum IV (median hairs on sternum IV shorter than those on V).

FLIGHT RECORDS (Figure 694).—Females of *L. egregium* have been collected in every month from February through November, with 65% of the records coming from June and July, with a peak in late June. Males have been taken from April to October, with 73% of the records from August and September.

FLOWER RECORDS.—Females (116): Scrophulariaceae 21%; Compositae 18%; Rosaceae 10%. Males (44): Compositae 93%. Total: 160 in 20 families, 47 genera as follows:

Apocynum 1♀; *Arctium* 1♂; *Arctostaphylos* 2♀; *Aster* 1♀, 23♂ (15 labeled *Aster* and *Grindelia*); **Baccharis* 1(1)♀; *Barbarea* 1♀; *Beloperone* 1♀; **Brassica* 1(1)♀; *Carduus* 1♂; *Centaurea* 3♂; *Chrysothamnus* 2♀, 2♂; *Cirsium* 1♂; **Clarkia* 2(2)♀; **Erigeron* 10(9)♀, 1♂; **Eriodictyon* 3(3)♀, 1♂; *Eriogonum* 1♀; *Erysimum* 1♀; **Gilia* 1(1)♀; *Grindelia* 1♂; *Gutierrezia* 1♂; **Hackelia* 1(1)♀; *Haplopappus* 1♂; *Hymenoxys* 1♀; *Hyptis* 1♀; *Iris* 1♂; *Isomeris* 3♀; **Lepidium* 7(7)♀; *Lotus* 1♀; *Marrubium* 2♀; *Melilotus* 7♀; **Oenothera* 1(1)♀; *Pastinaca* 1♀; **Penstemon* 21(8)♀; **Phacelia* 5(4)♀; **Physocarpus* 8(8)♀; **Polemonium* 2(2)♀; *Potentilla* 1♀; 1♂; **Prunus* 2(2)♀; **Rhus* 1(1)♀; *Ribes* 1♀; **Rosa* 1(1)♀; **Salix* 9(1)♀; *Scrophularia* 3♀; **Senecio* 1(1)♀; 3♂; *Sisymbrium* 1♀; *Stenotopsis* 2♀; *Trifolium* 2♀.

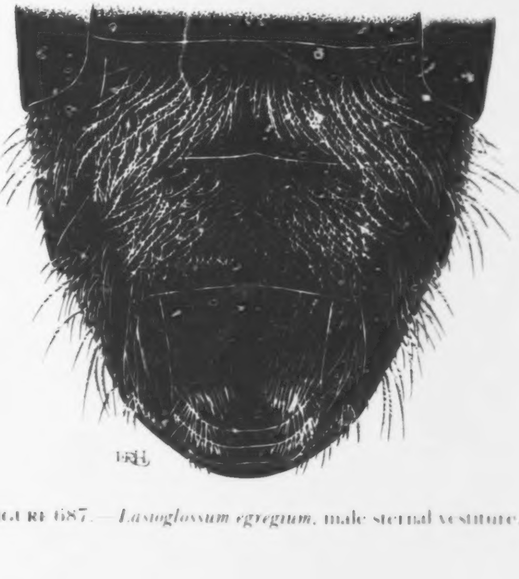


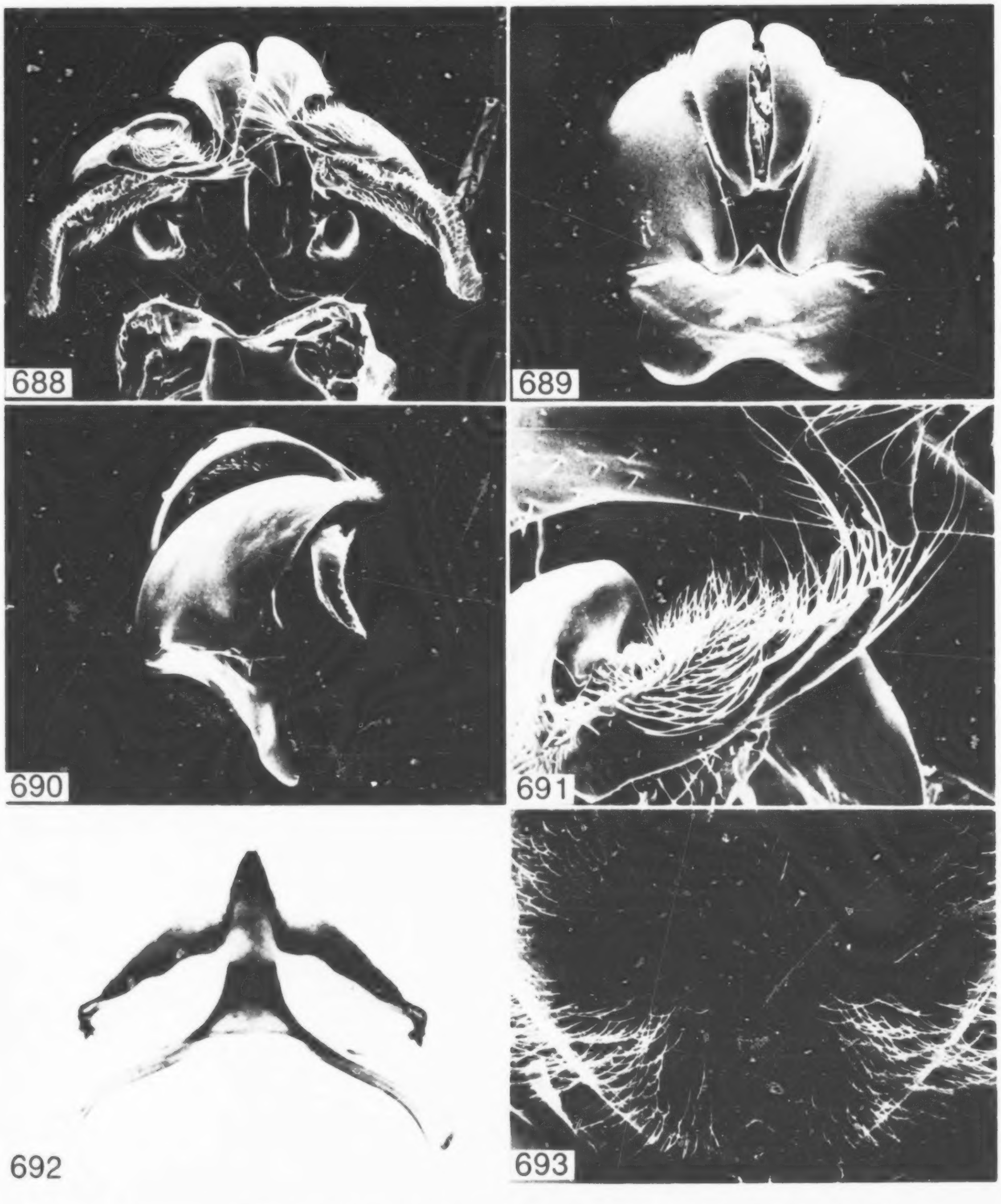
FIGURE 687.—*Lasioglossum egregium*, male sternal vestiture.

SPECIMENS EXAMINED.—894 (686♀, 208♂).

CANADA. ALBERTA: Banff. BRITISH COLUMBIA: Agassiz, Harrison Mills, Lillooet (Seton Lake), Nanaimo, Oliver, 7 mi N, Osoyoos, Robson (Waldie Road), Salmon Arm, Vernon. SASKATCHEWAN: Saskatoon.

UNITED STATES. ARIZONA: *Apache Co.*: Alpine; *Cochise Co.*: Bear Wallow, Sta. Catalina Mts.; *Coconino Co.*; *Gila Co.*: Globe; *Mojave Co.*: Hualapai Mts.; *Navajo Co.*: Navajo Mt.; *Pima Co.*: Sta. Catalina Mts., Marshall Gulch. CALIFORNIA: *Alameda Co.*: Arroya Mocha; *Alpine Co.*; *Del Norte Co.*: Gasquet; *El Dorado Co.*; *Fresno Co.*; *Humboldt Co.*: Shelter Cove; *Inyo Co.*; *Kern Co.*; *Los Angeles Co.*; *Madera Co.*: Ediza Lake, SE Slope Green Mt., meadow near locked gate on road to Mark Mine, first mine prospect above Willow Meadow; *Mariposa Co.*: Lake Tenaya (Yosemite National Park); *Modoc Co.*: Buck Creek Ranger Station; *Mono Co.*; *Monterey Co.*; *Nevada Co.*: Boca, Donners Summit; *Placer Co.*: G. Alpine Creek, Tahoe; *Riverside Co.*; *San Benito Co.*; *San Bernardino Co.*; *San Diego Co.*: Mt. Laguna, Pine Valley; *San Luis Obispo Co.*: La Panza Camp, Santa Margarita, 5 mi NE; *Santa Clara Co.*: Pacheco Pass; *Shasta Co.*: Hat Creek; *Sierra Co.*: Yuba Pass; *Siskiyou Co.*: Castle Lake, Lava Beds National Monument (Cave Loop Road), Poker Flat (23 mi NW Happy Camp); *Tehama Co.*: Deer Creek; *Tuolumne Co.*: Chipmunk Flat, Emigrant Lake, Strawberry Lake; *Ventura Co.*: Grade Valley (9 mi SW Stauffer P.O.), Lockwood Valley (near Stauffer P.O.), Quatal Canyon (NE part of county).

COLORADO: *Archuleta Co.*: Chimney Rock, Piedra; *Boulder Co.*; *Chaffee Co.*: Monarch Pass (2 mi W Garfield), Salida; *Clear Creek Co.*: Idaho Springs; *Costilla Co.*: Ft. Garland, 12 mi NE; *Delta Co.*: Paonia; *Denver Co.*: Denver; *Douglas Co.*: Franktown, 5 mi SSW; *El Paso Co.*: Foster Ranch, Garden of Gods, Manitou Park, Pike's Peak; *Fremont Co.*: Coaldale, 4 mi S, 5 mi S, 5 mi SW (Hayden Creek Campground); *Garfield Co.*: Douglas Pass (2.5 mi N), Rifle, White River Forest (10 mi NE Glenwood Springs); *Gilpin Co.*: Rollinsville, 1 mi N; *Grand Co.*: Hot Sulfur Springs (2 mi E), Kremmling; *Gunnison Co.*: Cement Creek Road, Crested Butte, 15 mi SE Jack's Cabin Cutoff Road; *Huerfano Co.*: North LaVeta Pass, 8 mi E; *Jefferson Co.*: Eldorado (1 mi S), Morrison, Plainveiw (1.3 mi N Golden); *La Plata Co.*: Durango; *Larimer Co.*; *Las Animas Co.*: Starkville; *Mesa Co.*: Grand Mesa (Land's End Road); *Mineral Co.*: South Fork Rio Grande River, 8 mi



FIGURES 688–693.—*Lasioglossum egregium:* 688, male genitalia, ventral view; 689, same, dorsal view; 690, same, lateral view; 691, male gonostylus; 692, male sterna VII–VIII; 693, female acarinarium at base of tergum I.

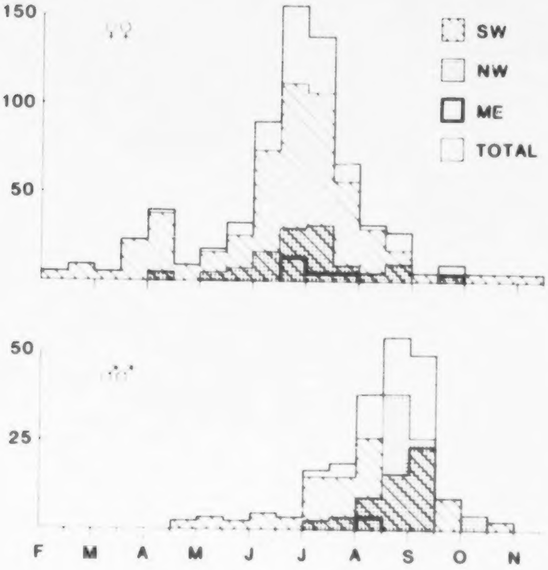


FIGURE 694.—*Lasioglossum egregium* flight records.

NW; *Moffat Co.*: Harper Corner; *Montezuma Co.*: Mesa Verde National Park; *Montrose Co.*: Buckeye Reservoir, Gunnison River Portal; *Rio Grande Co.*: South Fork, 3 mi W; *Routt Co.*: Phippsburg, 3 mi E; *Saguache Co.*: Cochetopa Creek; *Teller Co.*: Florissant Fossil Beds, Pike's Peak Halfway House.

IDAHO: *Butte Co.*: Craters of the Moon National Park; *Bonneville Co.*: Selander Park (10.5 mi SW Idaho Falls); *Custer Co.*: Herd Creek at East Fork Salmon River, Morgan Creek, Stanley (20–25 mi NE); *Elmore Co.*: Tollgate; *Franklin Co.*: Cub River Canyon, Preston, 28 mi E; *Fremont Co.*: Island Park, Ripley Butte; *Idaho Co.*: Harpster Grade; *Kootenai Co.*: Athol, Chilco, Coeur d'Alene; *Latah Co.*: Potlatch, Troy, 6 mi S; *Lemhi Co.*; *Nez Perce Co.*: Coyote Grade, Lewiston, Nez Perce, 10 mi N; *Oneida Co.*: Black Pine Canyon; *Owyhee Co.*: Indian Hot Springs, Jump Creek (10 mi N Homedale), Murphy Hot Springs. MONTANA: *Broadwater Co.*: Townsend, 14 mi E; *Carbon Co.*: East Rosebud Canyon, Roscoe, 3 mi SE; *Gallatin Co.*: Bozeman (15 mi S, 20 mi SW), Squaw Creek; *Glacier Co.*: Lake St. Mary; *Lake Co.*: Elmo; *Lewis and Clark Co.*: Helena, 10 mi N; *Missoula Co.*: Missoula; *Musselshell Co.*; NEVADA: *Clark Co.*; *Douglas Co.*: Valley Hot Springs; *Elko Co.*: Lamoille; *Esmeralda Co.*: Lida; *Humboldt Co.*: Santa Rosa Range; *Storey Co.*: Virginia City; *White Pine Co.*: Baker (7 mi W), Snake Creek. NEW MEXICO: *Catron Co.*: Bursum Camp (18 mi E Alma), Mogollon, 2 mi E; *Colfax Co.*: Cimarron Canyon, Ute Park, 2 mi W; *Grant Co.*: Silver City, 13–14 mi N (McMillan Camp); *Sandoval Co.*: Jemez Springs; *Santa Fe Co.*: Little Tesuque Canyon, vicinity Santa Fe, Santa Fe Canyon, Santa Fe; *Socorro Co.*: Magdalena.

NORTH DAKOTA: *Slope Co.*: Burning coal vein. OREGON: *Baker Co.*: Cornucopia, Union, 24 mi SE (Upper Goose Creek), 36 mi SE (Lower Goose Creek); *Benton Co.*: Corvallis; *Lake Co.*: Antelope Butte, Middle Fork Crooked Creek, Warner Mts.; *Linn Co.*: High Cascade Mts, Marion Forks; *Union Co.*: La Grande, Union, 28 mi SE (Upper Lick Creek); *Wallowa Co.*: Elgin (8 mi W), Hat Point, Wallowa Lake State Park (6 mi S Enterprise); *Wheeler Co.*: Mitchell, 1 mi E. SOUTH DAKOTA: *Custer Co.*: Custer State Park; *Fall River Co.*: Edgemont, Hot Springs; *Lawrence Co.*: Spearfish, 15 mi SSW.

UTAH: *Beaver Co.*: Beaver, Kent's Lake; *Cache Co.*; *Carbon Co.*: Helper; *Daggett Co.*: Pipe Creek; *Duchesne Co.*: North Fork Duchesne River; *Garfield Co.*: Bryce Canyon National Park; *Grand Co.*; *Iron Co.*: Buckskin Valley; *Juab Co.*: Ibapah-Callao Pass, Mt. Nebo; *Summit Co.*: Kamas, Riley Canyon, Wanship; *Tooele Co.*: South Willow Canyon (Stansbury Mts.), Tooele; *Uinta Co.*: Long Lake Reservoir, Route 44; *Utah Co.*: Provo; *Washington Co.*: Upper Deep Creek, Zion Canyon; *Weber Co.*: Farmington Canyon, Ogden. WASHINGTON: *Mason Co.*: Lake Cushman; *Okanogan Co.*: Omak; *Pend Oreille Co.*: Newport; *Spokane Co.*: Spokane; *Whitman Co.*: Pullman, Wawawai. WYOMING: *Albany Co.*: Laramie (8 mi SSE), Medicine Bow National Forest (Curtis Gulch Campground); *Fremont Co.*: Lander, 8.5 mi SW (Sinks Canyon); *Park Co.*: Muddy Creek, 1 mi S (Clark's Fork River), Sunlight Basin, north of Cody; *Teton Co.*; *Weston Co.*: Newcastle, 6 mi NW, 22 mi W.

46. *Lasioglossum mellipes* (Crawford)

FIGURES 40, 61, 695–707

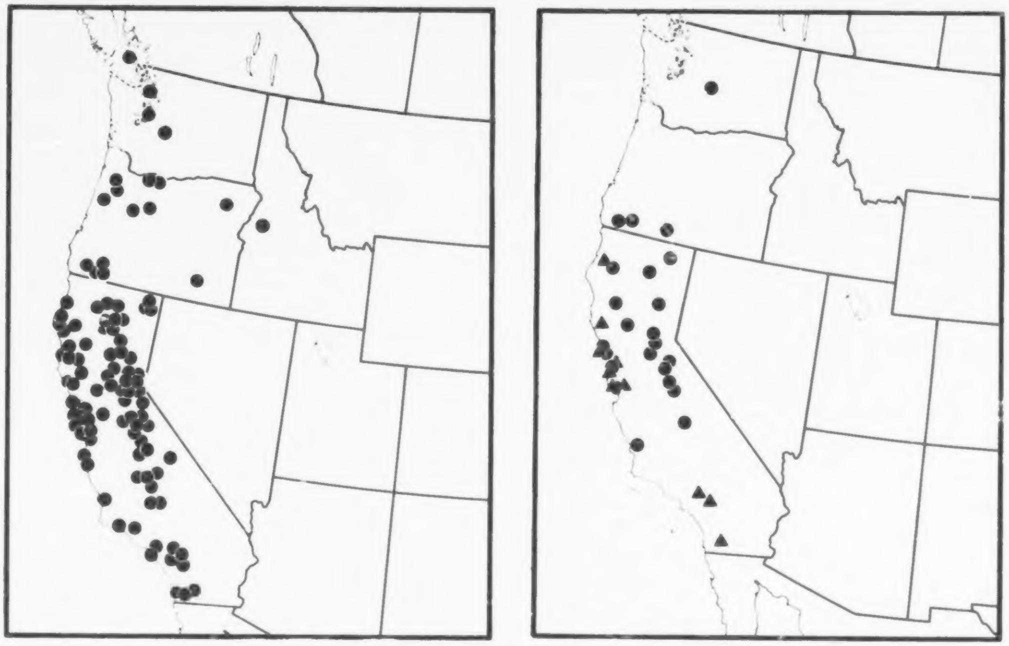
Halictus mellipes Crawford, 1907:190 [female].—Cockerell, 1941:343 [locality records, possible taxonomic status].

Lasioglossum mellipes.—Michener, 1951:1107 [Nearctic catalog].—Moldenke and Neff, 1974:52 [locality and flower records].—Hurd, 1979:1957 [Nearctic catalog].—Hurd et al., 1980:28, 65 [flower records].

TYPE MATERIAL.—The female holotype of *L. mellipes* is in the National Museum of Natural History, Smithsonian Institution. The specimen is in excellent condition and is labeled

Mts. [Mountains] near Claremont [Los Angeles County] Cal.[ifornia] Baker/[collected from] Ribes [handwritten/5051 [handwritten]/♀ Type No. 12036 U.S.N.M. [red label/Halictus mellipes ♀ Type Cwfd [Crawford] [handwritten].

DISTRIBUTION (Figures 695, 696).—*Lasioglossum mellipes* occurs from Vancouver Island through Washington, Idaho, Oregon, and California to San Diego County. Michener (1951)

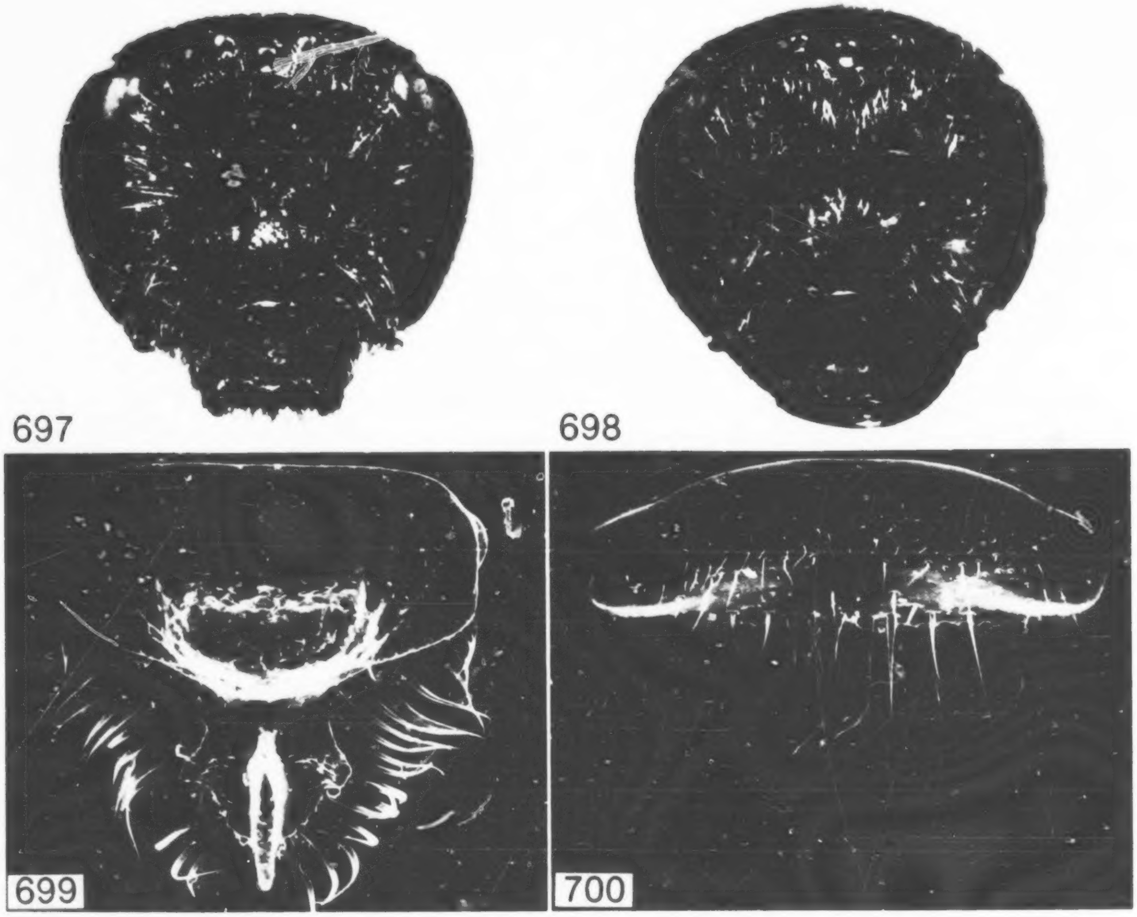


FIGURES 695, 696.—Distribution of *Lasioglossum mellipes*. *Left:* 695, females. *Right:* 696, males, short-haired forms (circle) and long-haired forms (triangle); see text for details.

reported this species from Baja California and this record has been restated by Hurd (1979) and Hurd et al. (1980). Although the occurrence of *L. mellipes* in Mexico is likely, I have not seen any specimens of this species taken south of the Mexican border.

DIAGNOSIS.—The characteristically sinuate lateral edge of tergum II (Figure 61), presence of an acarinarium on the anterior surface of tergum I (similar to Figure 693), and the yellowish orange mid and hind tarsi of most specimens will separate females of *L. mellipes* from other *Lasioglossum* species. Leg color appears to vary clinally with specimens from Oregon and Washington having entirely dark legs and those from San Bernardino and Los Angeles counties in California (the type-locality of *L. mellipes*) with pale mid tarsi, hind tarsi and hind tibiae. The hind tibiae of specimens from more northern California counties are mostly darkly pigmented with high levels of variation in color pattern occurring. Leg color also varies in the females of *L. anhypops*, but their lack of an acarinarium and their strongly excavated tergal II edge (Figure 154) will distinguish them from *L. mellipes*.

Males of *L. mellipes* can be recognized by their yellowish orange tarsi. As mentioned in the introductory remarks to the *trizonatum* group, the vestiture of sternum V is highly variable, with that of one male form having elongate, erect lateral hair tufts (Figure 701) and another having a conspicuous median rosette of erect hairs (Figure 702), with apparent intermediates occurring along the central California coastline. Other *Lasioglossum* males having pale legs in western United States are *L. lampronotum* and *L. titusi*, both of which have conspicuously short heads (Figures 487, 633); *L. channelense*, known only from the California Channel Islands and having a virtually complete pronotal lateral carina (obviously interrupted in the *trizonatum* males) and a very wide gena that exceeds the width of the compound eye as seen in lateral view (subequal in *trizonatum* males); and males of *L. paraforbesii*,



FIGURES 697–700.—*Lasioglossum mellipes:* 697, female head; 698, male head; 699, female labrum; 700, male labrum.

which lack a conspicuous hair pattern on sternum V (Figure 416) and occur west only to Idaho and Utah (Figure 406).

DESCRIPTION.—FEMALE: As described for *L. anhypops* except as follows: (1) Length 8.7–10.3 mm ($\bar{x}$ = 9.5, n = 15); (2) wing length 2.6–3.0 mm ($\bar{x}$ = 2.8, n = 15); (3) abdominal width 2.7–3.0 mm ($\bar{x}$ = 3.0, n = 15).

Structure: (4) Head moderately elongate to elongate (Figure 697; length/width ratio 0.88–1.0, $\bar{x}$ = 0.93, n = 15). (9) Clypeus projecting approximately 0.94 of its length below lower margin of eyes.

(46) Lateral edge of metasomal tergum II evenly sinuate (Figure 61).

Sculpture: (51) Supraclypeal area mostly polished, obscurely granulate laterally (52) punctures separated by their width or less basally, less dense centrally, punctures separated by 1–2 times their width. (53) Clypeus polished; (54) punctation nearly uniform basally, punctures separated by their width or less, apical one-third virtually impunctate. (63) Dorsal surface of propodeum finely striolate only over basal half, posterior half relatively smooth with obscure rugulae.

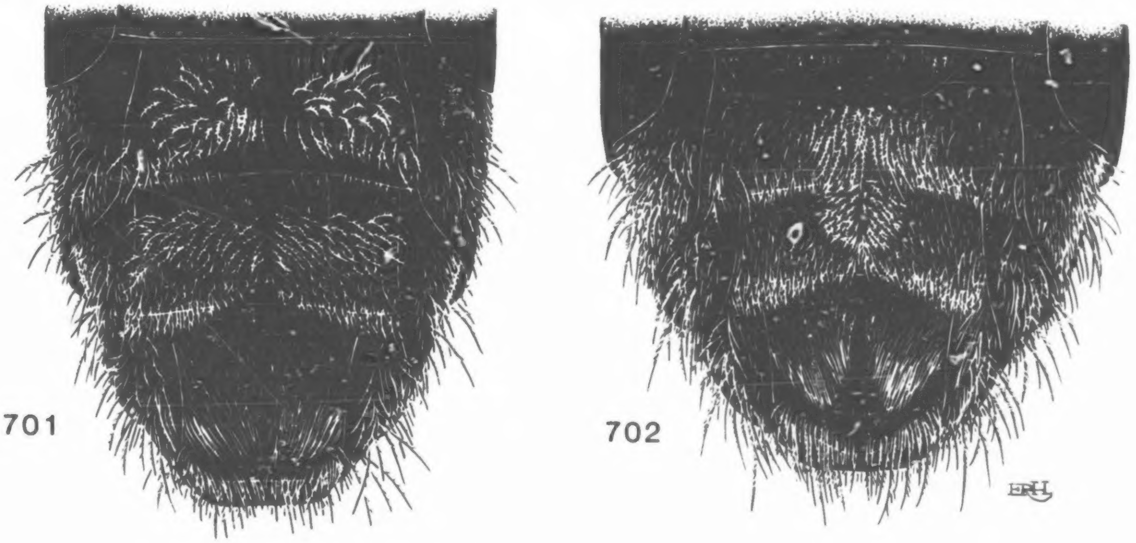
Coloration: (71) Wing membrane light yellowish brown, pigmentation moderately heavy at base of marginal cell, membrane becoming clearer towards apex. (72) Unlike most species, many specimens with mid and hind tarsi and in some specimens hind tibiae yellowish orange (see above diagnosis).

Vestiture: (74) Pubescence of head pale yellowish brown. (75) Pubescence of thorax mostly pale yellowish brown, white on pronotal lateral angle, pronotal lobe and metanotum. (78) Anterior hairs on metasomal tergum I pale yellowish brown. (80) Acarinarium present (similar to Figure 693), a large glabrous area at base of tergum I, surrounded laterally by elongate fringe hairs that lack a sharply delimited border; opening of acarinarium moderately wide, not sharply delimited, width subequal to width of lateral hair fringe as seen in dorsal view.

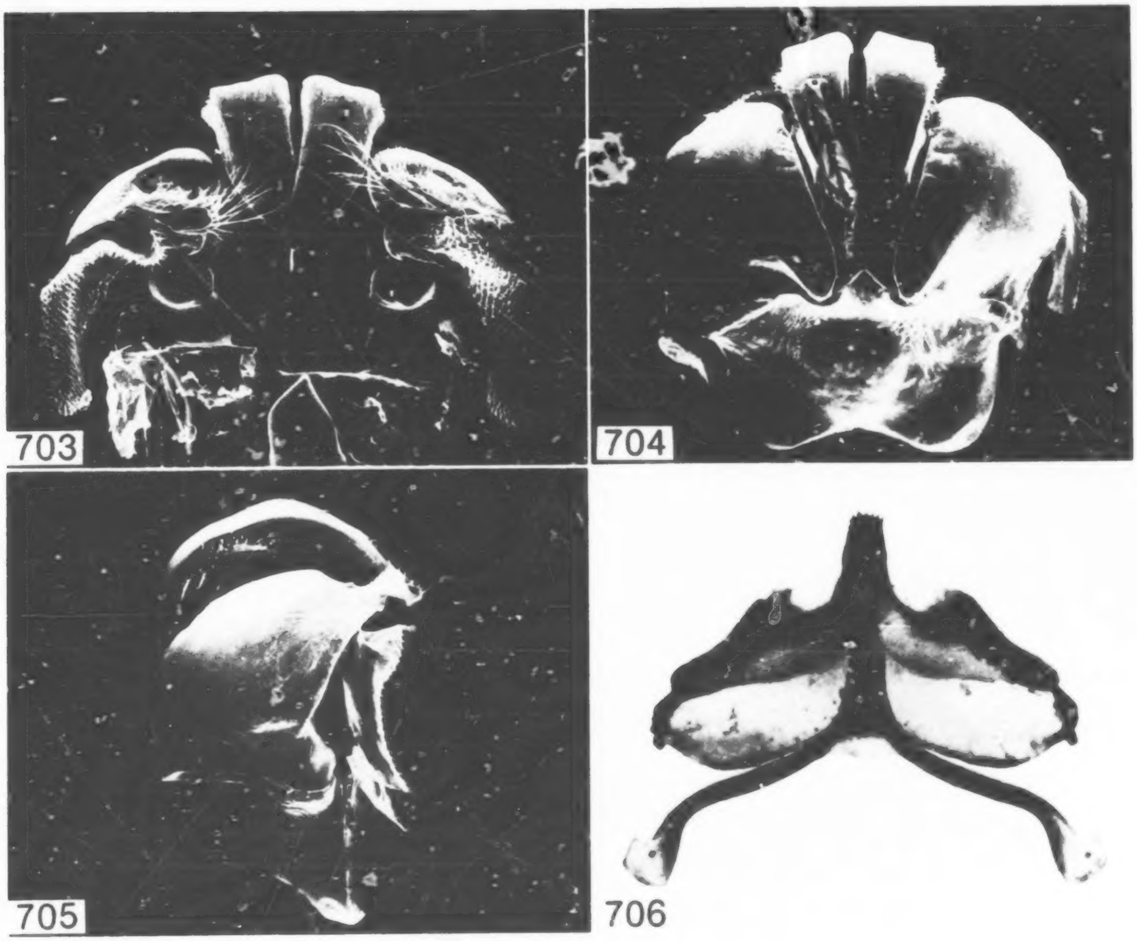
MALE: As described for *L. anhypops* except as follows: (1) length 7.8–9.2 mm ($\bar{x} = 8.4$, $n = 27$); (2) wing length 2.3–2.9 mm ($\bar{x} = 2.5$, $n = 27$); (3) abdominal width 2.0–2.7 mm ($\bar{x} = 2.2$, $n = 27$). (4) Head as in Figure 698 (length/width ratio 0.87–1.0, $\bar{x} = 0.96$, $n = 27$). (68) Clypeal maculation present. (69) Flagellum yellowish orange ventrally, contrasting with dark dorsum. (72) Tarsi yellowish orange, contrasting with dark tibiae.

Vestiture: Sternal vestiture as in Figures 701, 702; (82) hairs on sternum IV moderately elongate, erect; (83) vestiture of sternum V variable, median rosette of erect hairs present (sometimes conspicuously developed), hairs laterad of rosette short, inconspicuous or gradually becoming longer and noticeable towards lateral margin of sternum (see "Diagnosis" section).

FLIGHT RECORDS (Figure 707).—Females of *L. mellipes* have been taken in all months except November and January. Most specimens have been taken in late June, with 73% of the records coming from May through July. The two females taken in October were from Alameda County, California, and Harney County, Oregon. The female taken in December was also from Alameda County. Males of *L. mellipes* have been collected from late April through September, with most records from early July. There does not appear to be a significant difference in the flight periods of the two forms of *L. mellipes*



FIGURES 701, 702.—*Lasioglossum mellipes*, male sternal vestiture: 701, long-haired form; 702, short-haired form.



FIGURES 703–706.—*Lasioglossum mellipes*, male: 703, genitalia, ventral view; 704, same, dorsal view; 705, same, lateral view; 706, sterna VII–VIII.

males other than that the males with short hairs on sternum V possibly fly later than the males with long sternal hairs, reflecting the occurrence of the former form in the Sierra Nevada of California.

FLOWER RECORDS.—Females (108): Scrophulariaceae 23%; Compositae 10%; Cruciferae 8%; Ranunculaceae 7%. Males (12): Compositae 58%. Total: 120 in 26 families, 43 genera as follows:

Apocynum 1♂; *Aralia* 1♂; *Arctostaphylos* 4♀; *Asclepias* 1♀; *Æsculus* 1♀; *Baccharis* 1♀; **Brassica* 9(7)♀; **Calochortus* 3(2)♀; **Ceanothus* 1(1)♀; **Chamaebatia* 5(5)♀; *Chrysothamnus* 5♀; **Cirsium* 1(1)♀; **Convolvulus* 1(1)♀; *Cryptantha* 3♀; *Encelia* 1♀; *Eriodictyon* 1♀; *Eriophyllum* 1♀; *Gilia* 1♀; *Grindelia* 1♀; 4♂; *Gutierrezia* 1♂; *Haplopappus* 1♀; *Horkelia* 1♀; *Hyptis* 1♀; *Lomatium* 1♀; *Lupinus* 1♀; *Montia* 1♀; *Nama* 1♂; **Penstemon* 5(1)♀; *Phacelia* 5♀; *Quercus* 1♀; *Ranunculus* 8♀; *Rhododendron* 8♀; *Rhus* 1♀; *Ribes* 3♀; **Salix* 3(1)♀; *Salvia* 1♀; **Scrophularia* 19(3)♀; *Senecio* 2♂; *Sisyrinchium* 1♀; *Solanum* 4♀; *Symphoricarpus* 2♂; *Trifolium* 2♀; *Verbascum* 1♀.

SPECIMENS EXAMINED.—549♀.

CANADA. BRITISH COLUMBIA: Gabriola Island, Nanaimo Biological Station, Rocky Point.
MEXICO. BAJA CALIFORNIA: Sierra San Pedro Martin (3 mi S Encinas).
UNITED STATES. CALIFORNIA: *Alameda Co.*; *Amador Co.*;

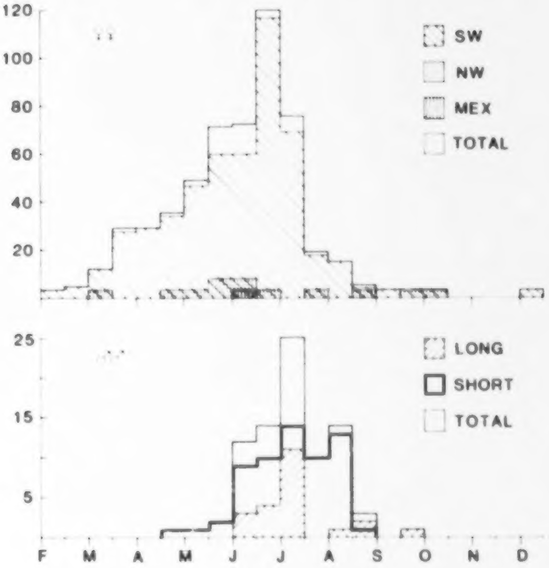


FIGURE 707.—*Lasioglossum mellipes* flight records.

Volcano; *Butte Co.:* East End Pentz Road, Province Creek, West Branch Feather River (2 mi S Stirling); *Calaveras Co.:* 4 mi S Railway Co.; *Colusa Co.:* Stonyford, 12 mi W; *Contra Costa Co.:* Briones Hills, Lafayette, Orinda, 4 mi NE (Russell Property), Richmond Point (San Pablo); *El Dorado Co.; Fresno Co.:* Florence Lake, Huntington Lake, Sulpher Meadow (Shaver Lake), Watts Valley; *Glenn Co.:* Plaskett Meadows; *Humboldt Co.; Inyo Co.:* Independence, North Fork Bishop Creek; *Kern Co.:* Alder Creek Public Campground, Alta Sierra (5 mi E), Glenville; *Lake Co.:* North Fork Cache Creek (Hwy 20), Pillsbury Lake; *Lassen Co.:* Bridge Creek Camp; *Los Angeles Co.; Madera Co.:* Big Creek at Boggy Meadow (1.75 air mi ESE Fish Camp); *Marin Co.; Mariposa Co.:* Mariposa, Pleasant Valley, Soap Creek; *Mendocino Co.; Modoc Co.:* Alturas (20 mi N), Cedar Pass, Davis Creek (5 mi N); *Monterey Co.; Napa Co.:* Pope Valley, Samuel Spring; *Nevada Co.:* Alta, Boca, Camp Arcade, Lake Spaulding, Sagehen near Hobart Mills; *Orange Co.:* Back Bay, Silverado Canyon; *Placer Co.:* Auburn (8 mi E), Forest Hill (13 mi E), Great Alpine Creek, Lake Forest (Lake Tahoe); *Plumas Co.; Riverside Co.; Sacramento Co.:* Citrus Heights; *San Bernardino Co.; San Diego Co.; San Joaquin Co.:* Stockton; *San Francisco Co.:* San Francisco; *San Luis Obispo Co.:* San Luis Obispo; *San Mateo Co.; Santa Barbara Co.:* Cachuma Campground (Los Padres National Forest), San Co.: The Geysers, Gualala (3 mi S), Mesa Grande, Plantation (4 mi W), Santa Rosa; *Tehama Co.:* Government Flat, Lassen National Forest (Lost Creek); *Trinity Co.; Tulare Co.; Tuolumne Co.; Ventura Co.:* Mt. Pinos; *Yolo Co.:* Davis, Putah Canyon, Rumsey; *Yuba Co.:* Challenge, Sierra Foothill Field Station (5 mi N Smartville), Sly Creek Reservoir.

IDAHO: *Valley Co.:* Donnelly. OREGON: *Benton Co.:* Corvallis; *Clackamas Co.:* Colton; *Harney Co.:* Fish Lake (Steen Mts.); *Hood River Co.:* Odell; *Jackson Co.; Jefferson Co.:* Warm Springs; *Josephine Co.:* Grant's Pass, 11 mi N; *Klamath Co.:* Eagle Ridge; *Linn Co.:* Roving River Fish Hatchery, Trout Creek Camp (S Santiam Pass); *Marion Co.:* Marion, Salem; *Wasco Co.:* The Dalles; *Yamhill Co.:* Yamhill. WASHINGTON: *Island Co.:* Coupeville; *King Co.:* Seattle; *Kittitas Co.:* Cliffdell.

Because of the variability in male sternal vestiture and the possibility that two species are involved, male records are divided to show the approximate pattern of sternal variation. Intermediate forms from coastal central California are not indicated in the following listing of 35 males with elongate, erect lateral hair tufts on sternum V.

CALIFORNIA: *Alameda Co.:* Alameda foothills, Berkeley; *Contra Costa Co.:* Mt. Diablo State Park; *Humboldt Co.:* Willow Creek; *Los Angeles Co.:* Arroyo Seco, Tanbark Flat; *Marin Co.:* Bolinas, Mill Valley; *Mendocino Co.:* U.C. Hopland Field; *San Bernardino Co.:* Dollar Lake Trail (San Bernardino Mts.), Lake Arrowhead; *San Diego Co.; San Mateo Co.:* Menlo Park, Sierra Morena; *Santa Clara Co.; Santa Cruz Co.:* Mt. Harmon, Santa Cruz (Big Trees); *Sonoma Co.:* Cloverdale, 2.5 mi NW.

The following listing is comprised of 66 males with median rosette of hairs on sternum V.

CALIFORNIA: *Alameda Co.:* Alameda foothills, Berkeley, Piedmont, Redwood Regional Park (East Ridge Trail); *Amador Co.:* Ione, 5 mi W (Highway 104); *Colusa Co.:* Sycamore; *Contra Costa Co.:* Point Richmond, San Pablo Point, San Pablo Reservoir, Wildcat Canyon; *Eldorado Co.:* Fallen Leaf, Placerville, 10 mi N; *Fresno Co.:* Watts Valley; *Glenn Co.:* Plaskett Meadows; *Madera Co.:* Sugar Pine; *Marin Co.:* Inverness, McClure's Beach, Pt. Reyes; *Mariposa Co.:* Summerdale Campground (Sierra National Forest); *Modoc Co.:* Upper Rush Creek Campground (10 mi S Canby); *Placer Co.:* Weimar; *Plumas Co.:* Antelope Valley, Quincy, 4 mi W; *San Francisco:* San Francisco; *San Luis Obispo Co.:* Pico Creek; *San Mateo Co.:* Menlo Park, Pomponio State Park, San Bruno Mts.; *Santa Cruz Co.:* Mission Springs; *Shasta Co.:* Clayton, French Gulch, 5 mi N; *Sonoma Co.:* Bodega Bay; *Trinity Co.:* Big Bar, 3 mi NW; *Tulare Co.:* Milo (15 mi W Mineral King), Three Rivers; *Tuolumne Co.:* Strawberry, Twain-Harte. OREGON: *Jackson Co.:* Colestin, Gold Hill; *Josephine Co.:* Oregon Caves; *Klamath Co.:* Dairy, 10 mi E. WASHINGTON: *Kittitas Co.*

47. *Lasioglossum trizonatum* (Cresson)

FIGURES 57, 708–718

Halictus trizonatus Cresson, 1874:101 [female].—Dalla Torre, 1896:87 [World catalog].—Crawford, 1906:303

[locality record, taxonomic notes].—Cockerell, 1906:293 [locality and taxonomic notes]; 1908:120 [locality and flower records].

Lasioglossum trizonatum.—Michener, 1951:1107 [Nearctic catalog].—Linsley et al., 1963:42 [locality and flower records].—Moldenke and Neff, 1974:59 [flower records].—Hurd, 1979:1598 [Nearctic catalog].

Type Material.—In a review of his types, Cresson (1916) indicated that the female holotype of *Halictus trizonatus* could not be located. A recent search for this specimen was also unsuccessful. Because of the taxonomic confusion concerning forms in the *trizonatum* group, it is necessary to stabilize the use of this name by designating a neotype. Cresson's description was generalized and does not clearly indicate which *trizonatum* form he had before him. However, he does mention that the specimen was from Nevada (unspecified locality) and that it had black legs. Both the locality and leg color indicate that Cresson did not have a specimen of *L. anhypops* or *L. mellipes*. *Lasioglossum egregium* occurs in Nevada and has black legs; however, this name is stabilized by the availability of Vachal's type material. I therefore choose as a neotype for *L. trizonatum* a specimen, also from Nevada, that is representative of a widespread *trizonatum* form with black legs that is in need of a stabilized name (see introductory remarks for the *trizonatum* group and following diagnosis for comparison to other *trizonatum* forms). The neotype is the property of the California Insect Survey, University of California, Berkeley, but is on loan deposit to the California Academy of Sciences in San Francisco. The specimen is in good condition and is labeled

Nev[ada]: Elko Co.[unty], E slope, Spruce Mtn.[Mountain] VI [June]-26-[19]56/W.C. Russell Collector/NEOTYPE Halictus trizonatus Cresson des.[ignated by] R.J. McGinley [handwritten on red label].

Distribution (Figure 708).—*Lasioglossum trizonatum* has been collected in British Columbia (including Moresby Island), Alberta, and Manitoba and is widespread in western United States. In California it is found only along the eastern border of the Sierra Nevada and is very common in Mono County. Females having a very sharply excavated lateral edge of tergum II have been most commonly collected in Colorado and Utah, whereas specimens with a more rounded tergal emargination are widespread.

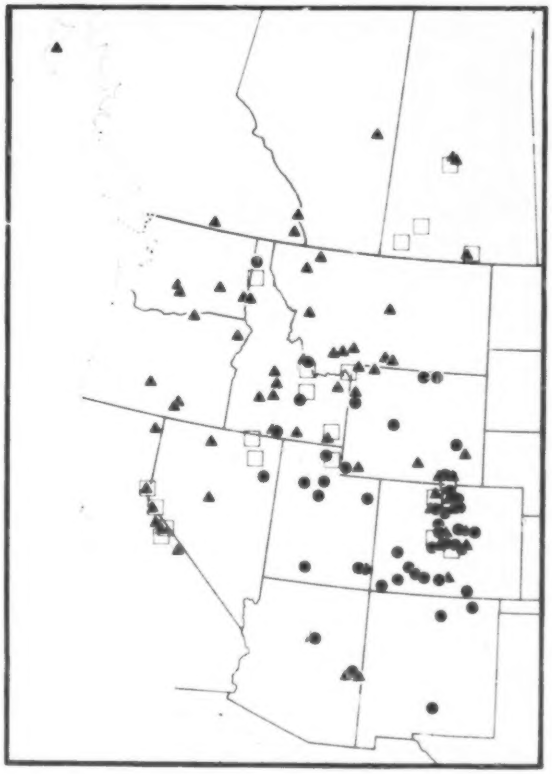
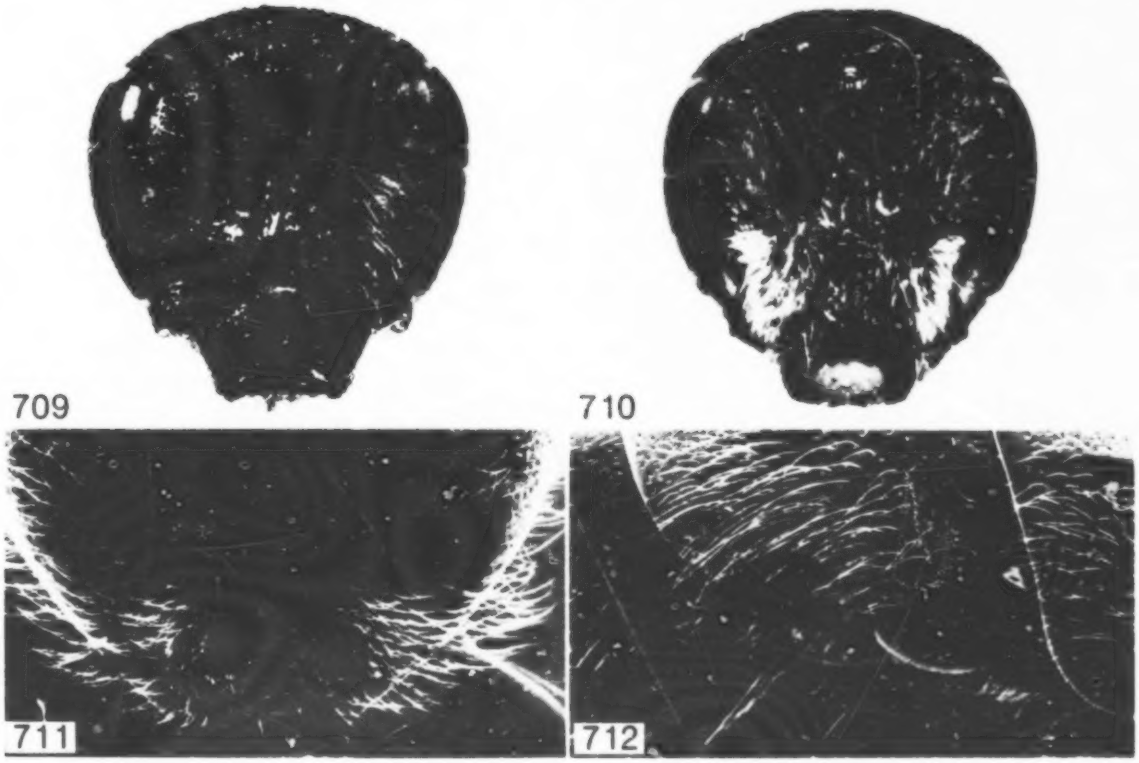


FIGURE 708.—Distribution of *Lasioglossum trizonatum*: females with lateral edge of tergum II strongly sinuate (circle), females with edge moderately sinuate (triangle), males (open square).

Diagnosis.—Females of *L. trizonatum* can be distinguished from other *trizonatum* forms by their conspicuously elongate heads (Figure 709, length/width ratio $\bar{x}$ = 0.96–1.02), acarinaria on the anterior surface of tergum I (Figure 711), and moderately to strongly excavated lateral edges of tergum II (Figure 115). *Lasioglossum anhypops* females have a similar tergal edge but have shorter heads (Figure 670, length/width $\bar{x}$ = 0.93, n = 15) and lack acarinaria (Figure 85). Some females in Mono County with only mod-



FIGURES 709–712.—*Lasioglossum trizonatum:* 709, female head; 710, male head; 711, female acarinarium at base of tergum I; 712, lateral edge of female tergum II.

erately sinuate tergal edges can be differentiated from those of *L. mellipes* by their longer heads and black legs (hind tarsi and often hind tibiae usually yellowish orange in *L. mellipes*).

The males associated with *L. trizonatum* have conspicuously elongate heads (Figure 710, length/width ratio x̄ = 1.02) but are highly variable, possibly indicating that more than one species is involved. Most males are unique among *Lasioglossum* species in having antennal tyli (differentiated, oval areas on flagellomeres having only plate sensilla and lacking peg sensilla, Figures 714, 715). Most males with tyli have moderately elongate, erect lateral hair tufts on sternum V (Figure 713), but those from Mono County have very short, inconspicuous sternal hairs. Many males with conspicuously elongate heads have short sternal hairs similar to the Mono County forms but lack antennal tyli. I have seen specimens with only weakly differentiated tyli and therefore hesitate in recognizing the "tyli" and "non-tyli" forms as being distinct.

DESCRIPTION.—FEMALE: As described for *L. anhypops* except as follows: (1) Length 8.4–11.5 mm (x̄ = 9.5, n = 25); (2) wing length 2.5–3.1 mm (x̄ = 2.8, n = 25); (3) abdominal width 2.6–3.3 mm (x̄ = 2.9, n = 25).

Structure: (4) Head very elongate (Figure 709; length/width ratio 0.92–1.04, x̄ = 0.97, n = 33). (7) Supraclypeal area evenly rounded, (8) moderately protuberant.

(46) Lateral edge of metasomal tergum II similar to that of *L. anhypops* but differing from all other *trizonatum* forms in being strongly exca-

vated, sharply angulated (as in Figure 154) or rounded medially (Figure 115).

Coloration: (71) Wing membrane pale yellowish brown, becoming hyaline near apex.

Vestiture: (74) Pubescence of head white. (75) Pubescence of thorax white. (77) Hind tibial hairs pale yellowish brown. (80) Acarinarium present (Figure 711), a moderately large glabrous area at base of tergum I, surrounded laterally by elongate fringe hairs, which lack a sharply delimited border; acarinarial surface often with some scattered hairs; dorsal opening of acarinarium moderately wide, not sharply delimited, width slightly less than width of lateral hair fringe as seen in dorsal view.

MALE: As described for *L. anhypops* except as follows: (1) length 7.7–8.5 mm ($\bar{x} = 8.1$, $n = 9$); (2) wing length 2.1–2.6 mm ($\bar{x} = 2.3$, $n = 9$); (3) abdominal width 1.8–2.2 mm ($\bar{x} = 2.0$, $n = 9$). (4) Head as in Figure 710 (length/width ratio 1.0–1.05, $\bar{x} = 1.02$, $n = 18$). (68) Clypeal maculation present.

Vestiture: Sternal vestiture as in Figure 713; (82) hairs on sternum IV elongate, erect; (83) vestiture of sternum V variable, inconspicuous, median rosette of hairs present, hairs laterad of rosette erect, inconspicuous or becoming noticeably elongate towards lateral margin of sternum (see "Diagnosis" section).

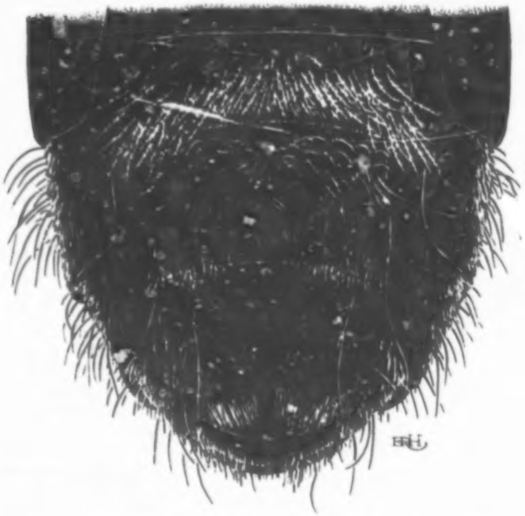


FIGURE 713.—*Lasioglossum trizonatum*, male vestiture.

FLIGHT RECORDS (Figure 718).—Females of *L. trizonatum* have been collected from early April through September. Records of those from the southwestern region peak in early June, whereas those from the Northwest peak in late June.

FLOWER RECORDS.—Females (96): Salicaceae 26%; Rosaceae 23%; Compositae 23%. Total: 96 in 12 families, 28 genera as follows:

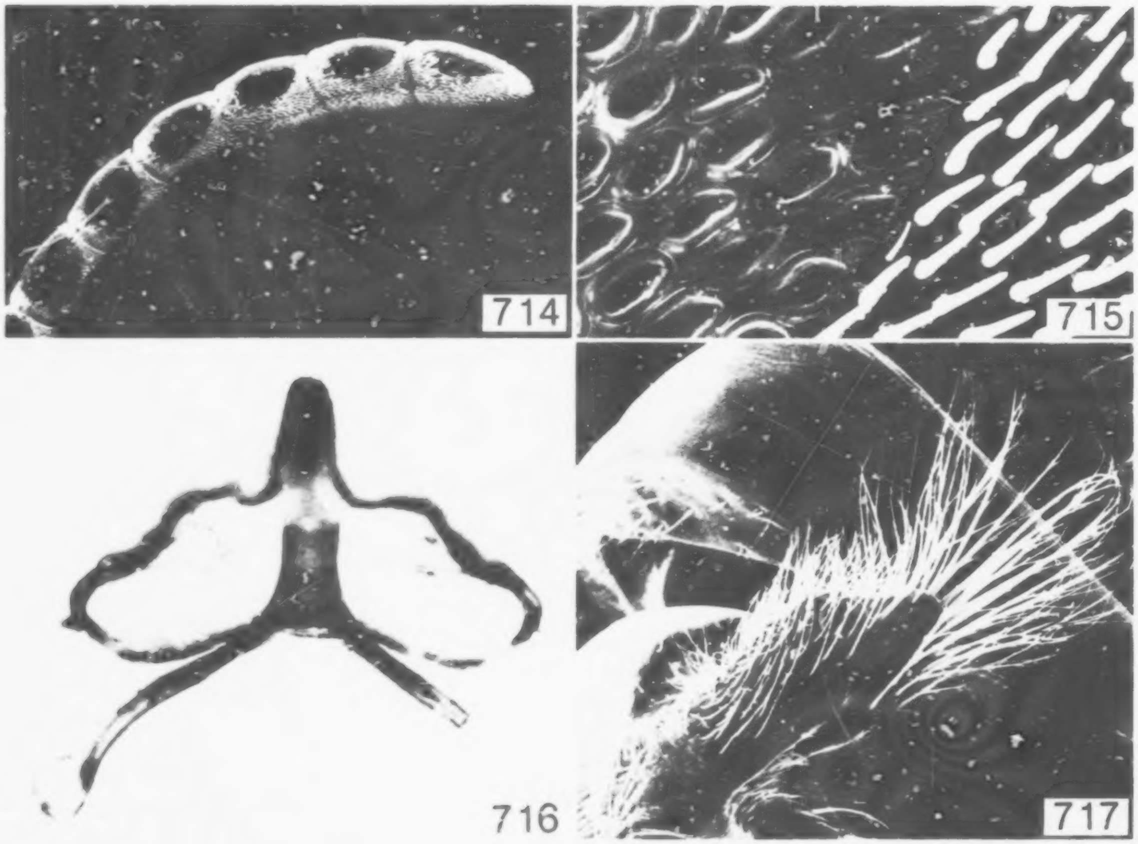
Achillea 1♀; *Agoseris* 1♀; *Anemone* 1♀; *Aster* 1♀; *Astragalus* 1♀; *Balsamorhiza* 1♀; **Barbarea* 2(2)♀; *Chrysothamnus* 2♀; *Crepis* 3♀; **Erysimum* 5(5)♀; **Frasera* 1(1)♀; *Geum* 3♀; *Gilia* 7♀; **Heterotheca* 1(1)♀; **Irish* 5(3)♀; **Lappula* 1(1)♀; **Penstemon* 3(1)♀; *Phacelia* 2♀; *Phlox* 1♀; *Potentilla* 1♀; **Prunus* 12(3)♀; **Purshia* 2(1)♀; *Ribes* 1♀; **Rubus* 4(2)♀; **Salix* 25(4)♀; *Senecio* 1♀; **Taraxacum* 7(4)♀; *Thermopsis* 1♀.

SPECIMENS EXAMINED.—247 females with lateral edge of tergum II sharply excavated.

UNITED STATES. ARIZONA: *Apache Co.:* Greer, White Mts., Winn Campground; *Coconino Co.:* Flagstaff. CALIFORNIA: *Mono Co.:* Lee Vining, Summit of Sonora Pass; *Yolo Co.:* Davis, 22 mi W. COLORADO: *Alamosa Co.:* Great Sand Dunes National Monument (Montville Trail); *Boulder Co.; Chaffee Co.:* Chalk Creek (8 mi W Northrup), Salida, South Arkansas River; *Douglas Co.:* West Creek; *Elbert Co.:* Elbert (including Hubbard Ranch); *El Paso Co.:* Colorado Springs, Manitou; *Gilpin Co.:* Idaho Springs; *Grand Co.:* Kremmling, 2 mi S, 9 mi SW; *Hinsdale Co.:* Lake City; *Jefferson Co.; La Plata Co.:* Electra Lake; *Larimer Co.; Las Animas Co.:* Starkville; *Mesa Co.:* Mud Springs (Pinyon Mesa); *Mineral Co.:* Creede; *Moffatt Co.:* Zenobia Peak; *Montezuma Co.:* Mesa Verde National Park; *Montrose Co.:* Buckeye Reservoir, Uncompahgre Plateau (16 mi SW Montrose); *Park Co.:* Jefferson (4 mi SE), Wilkerson Pass; *Rio Grande Co.:* South Fork; *Summit Co.:* Peak One Campground (Arapaho National Forest); *Teller Co.:* Florissant Fossil Beds, Florissant, 2.5 mi S.

IDAHO: *Bonner Co.:* Priest River Experiment Forest; *Butte Co.:* Little Cottonwood Creek (Craters of the Moon National Monument); *Lemhi Co.:* Bannock Pass; *Oneida Co.:* Black Pine Canyon; *Twin Falls Co.:* Magic Mt. NEVADA. *Elko Co.:* E slope of Spruce Mt. NEW MEXICO: *Colfax Co.:* Folson, 11 mi WNW; *Otero Co.:* Cloudcroft, 2.5 mi E; *Taos Co.:* Taos (Hondo Canyon). UTAH: *Box Elder Co.:* Mantua (5 mi S), Willard Peak; *Cache Co.; Garfield Co.:* E fork Sevier River (West Bryce); *Grand Co.:* Moab (La Sal Mt.); *Iron Co.:* Cedar City, 20 mi E; *Kane Co.:* Bryce Canyon National Park (2 mi N Natural Bridge); Kanab Creek; *Rich Co.:* Garden City; *San Juan Co.:* Kigalie Ranger Station (La Sal National Forest), Monticello; *Tooele Co.:* Loop Camp (13 mi SW Grantsville);

AVAILABLE



FIGURES 714–717.—*Lasioglossum trizonatum*, male: 714, antenna with tyli (circular areas lacking sensillar pegs); 715, close-up of antennal tylus; 716, sterna VII–VIII; 717, gonostylus.

South Willow Canyon (Stansbury Mts.); *Uinta Co.:* Vernal, 25 mi N; *Utah Co.:* Mt. Nebo Loop, Provo; *Weber Co.:* Ogden Canyon. WYOMING: *Albany Co.; Converse Co.:* Esterbrook; *Fremont Co.; Sheridan Co.:* Dayton, mountains near Sheridan; *Teton Co.:* Grand Tetons, Jackson Hole, Jenny Lake; *Uinta Co.:* Evanston, 15 mi E.

The following listing is comprised of 225 females with lateral edge of tergum II moderately excavated.

CANADA. ALBERTA: Banff, Wainwright. BRITISH COLUMBIA: Cranbrook; Golden; Oliver; Osoyoos; 10 mi E; Penticton, Sandspit (Moresby Island, Queen Charlotte Islands). SASKATCHEWAN: Dundurn; Rockglen; Saskatoon.

UNITED STATES. ARIZONA: *Apache Co.:* Alpine, McNary; *Coconino Co.:* Flagstaff, Ft. Valley, Hart Prarie (10 mi NNW Flagstaff). CALIFORNIA: *Alpine Co.:* west slope Monitor Pass; *Inyo Co.:* Independence; *Modoc Co.:* Cedar Pass; *Mono Co.; Nevada Co.:* Prosser Creek (south side, 2.5 mi S Hobar Mills), Truckee; *San Bernardino Co.:* Pineknot; *Alamosa Co.:* Giant Sand Dunes National Monument; *Boulder Co.:* Allenspark, Boulder, Ward, 2 mi E; *Chaffee-Park Co.* border: Trout Creek Pass; *Costilla Co.:* Ft. Garland, 12 mi NE; *Douglas Co.:* West Creek; *Elbert Co.:* Elbert (including Hubbard Ranch); *Grand Co.:* Kremmling, 2 mi S; *Jackson Co.:* Walden; *Jefferson Co., Larimer Co.:* Estes Park, West Estes Park; *Park Co.:* Jefferson (4 mi SE), Wilkerson Pass.

IDAHO: *Blaine Co.:* Galena; *Camas Co.:* Willow Creek (13 mi NE Fairfield); *Cassia Co.:* Elba, 6 mi W; *Custer Co.:* Stanley, 20–25 mi NE; *Elmore Co.:* Dixie, 3.5 mi S; *Franklin Co.:* Weston Canyon; *Fremont Co.:* St. Anthony (sand dunes); *Latah Co.:* Moscow, Moscow Mt.; *Lemhi Co.:* Bannock Pass; *Twin Falls Co.:* Rogerson, 8 mi S. MONTANA: *Carbon Co.:* Bearcreek, East Rosebud Valley (5 mi S Roscoe); *Fergus Co.:* Lewiston, 13 mi NE; *Flathead Co.:* Big Fork; *Gallatin Co.:*

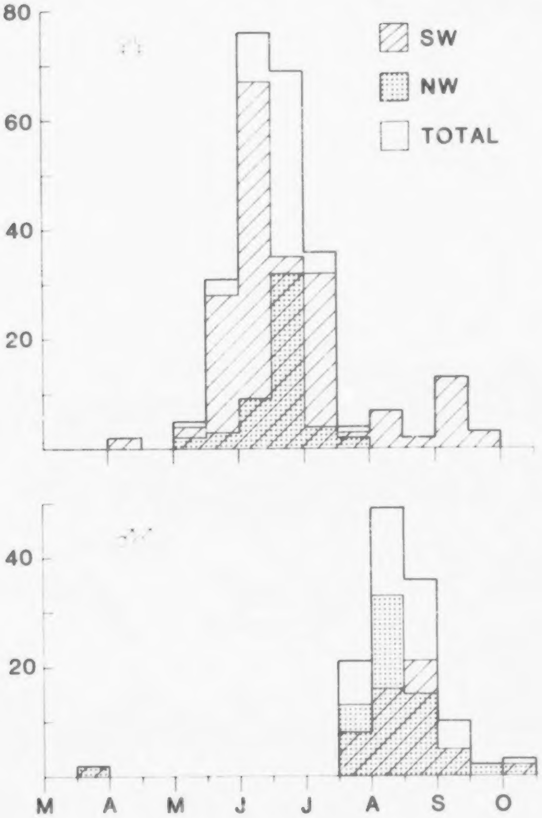


FIGURE 718.—*Lasioglossum trizonatum* flight records.

Bozeman, 15 mi S; *Glacier Co.:* Lake St. Mary (Glacier National Park); *Granite Co.:* Elkhorn Ranch (9 mi S Clinton); *Madison Co.:* Rock Creek and Madison River (Gallatin National Forest), Ruby Reservoir (9 mi S Alder). NEVADA: *Eureka Co.:* Red House Ranch; *Humboldt Co.:* Lye Creek Camp (18 mi N Paradise Valley); *Lander Co.:* Austin, 5 mi E (Cahill Canyon), 8 mi E. OREGON: *Lake Co.:* Hart Mt. (Antelope Refuge), Silver Lake (12 mi SW), Warner Lakes; *Morrow Co.:* Boardman; *Wallowa Co.:* Joseph. UTAH: *Rich Co.:* Garden City. WASHINGTON: *Adams Co.:* Lake McElroy (Paha); *Whitman Co.:* Pullman; *Yakima Co.:* North Yakima, Wenas Valley, Yakima. WYOMING: *Albany Co.; Carbon Co.:* Rawlins; *Fremont Co.:* Lander (Fossil); *Park Co.:* Lake Creek Camp (13 mi SE Cooke City), Mammoth Hot Springs (Yellowstone National Park); *Platte Co.:* Wheatland; *Teton Co.:* Jenny Lake, Snake River (5 mi S Elk); *Uinta Co.:* Lyman, 7 mi W.

The following listing is comprised of 127 males.

UNITED STATES. CALIFORNIA: *Mono Co.:* Virginia Creek, White Mt. (Blanco's Corral). COLORADO: *Boulder Co.:* Boulder, Boulder Canyon, Jim Creek; *Jefferson Co.:* Evergreen; *Larimer Co.:* Estes Park, Ft. Colins, Livermore (18 mi W); *Teller Co.:* Florissant Fossil Beds. IDAHO: *Bonner Co.:* Priest River Experimental Forest; *Butte Co.:* Craters of the Moon National Monument (Little Cottonwood Creek). NEW MEXICO: *Otero Co.:* Cloudcroft (2.5 mi E). UTAH: *Tooele Co.:* Loop Camp (13 mi SW Grantsville). WYOMING: *Albany Co.:* Tie Siding (4.5 mi SW); *Fremont Co.:* Sinks Canyon (8.5 mi SW Lander); *Sheridan Co.:* Dayton, Sheridan (mountains near).

48. *Lasioglossum tropidonotum*, new species

FIGURES 58, 174, 300, 719–723

TYPE MATERIAL.—The female holotype is the property of the California Insect Survey, University of California, Berkeley, but is on loan deposit to the California Academy of Sciences in San Francisco. The specimen is in excellent condition and is labeled

4 mi NW Ocosingo Chiapas, MEX. III [Mar]-8-1953/R.C. Bechtel E.I. Schlinger Collectors/[green unlabeled paper point]/LASIOGLOSSUM ? det. G.C. Eickwort/HOLOTYPE Lasioglossum tropidonotum R.J. McGinley [red label].

The male paratype listed in the "Specimens Examined" section is deposited in the collection of the University of California at Berkeley.

ETYMOLOGY.—The specific epithet is derived from the Latin *tropidos* (keel) and alludes to the distinctive, mesoscutal ridge that is unique to this species.

DISTRIBUTION (Figure 300).—*Lasioglossum tropidonotum* is known only from the female holotype and male paratype, both from the vicinity of Ocosingo in the state of Chiapas, Mexico.

DIAGNOSIS.—Both sexes of *L. tropidonotum* have a unique, median mesoscutal ridge near the anterior mesocutal margin (Figure 174). The female is also unique in having an extremely protuberant clypeus and having the frons and vertex covered with thick, distally recurved setae (Figures 174, 723). Furthermore, the female has sterna IV–V entirely covered by short, pale pubescence (found elsewhere only in *L. crocoturum* and *L. cercothrix*).

DESCRIPTION.—FEMALE: (1) Length 10.3 mm (n = 1); (2) wing length 2.6 mm; (3) abdominal width 3.0 mm.

Structure: (4) Head elongate (Figure 174; length/width ratio 0.96). (7) Supraclypeal area narrowly rounded ventrally, (8) protuberant. (9) Clypeus projecting approximately 0.76 of its length below lower margin of eyes; (10) surface without median longitudinal sulcation. (14) Distance between lateral ocelli subequal to distance between lateral ocellus and eye. (23) Flagellomere 1 subequal to 2 along dorsal surface. Labrum virtually identical to that of *L. circinatum*, Figure 333; (27) distal keel moderately broad, widest basally; (29) distal lateral projections virtually absent, evident as obscure swellings; (29) most fimbrial setae blunt apically.

(32) Pronotal lateral angle narrowly obtuse; (33) pronotal lateral ridge incomplete, interrupted by oblique lateral sulcus; (34) lower portion of lateral ridge narrowly rounded. (34) Mesoscutal lip not bilobed, (35) very weakly elevated from pronotum; unlike all other known *Lasioglossum*, the mesoscutum is elevated as a median longitudinal ridge near the anterior margin. (39) Dorsal surface of propodeum about 0.83 the length of scutellum and about 1.2 times the length of metanotum, (40) slightly depressed centrally, (41) posterior margin broadly rounded; (42) propodeal triangle weakly defined, evident medially as a very low V-shaped elevation without lateral rims; (43) lateral carinae extending at most to midpoint of posterior surface. (44) Tibial spur as in Figure 58.

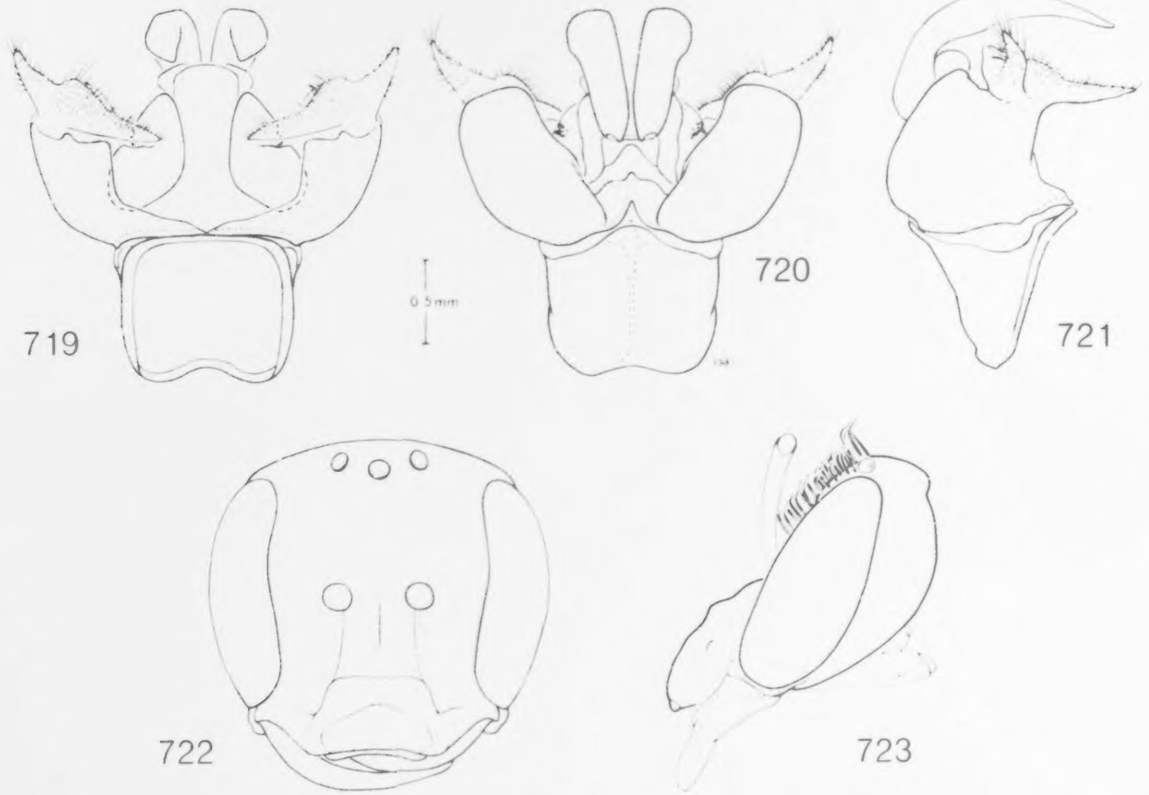
(46) Lateral edge of metasomal tergum II weakly sinuate, nearly straight.

Sculpture: (47) Face weakly shiny, (48) densely and contiguously punctate below ocelli to antennae. (51) Supraclypeal area granulate, roughened ventrally; (52) punctures separated by their width. (53) Clypeus moderately granulate throughout; (54) punctures very dense, nearly contiguous over basal half, being larger and obscurely formed apically. (56) Mesoscutum moderately shiny; (57) punctation very similar to that of *L. circinatum*, Figure 335, obscurely doubly-punctate, smaller punctures extremely dense, contiguous throughout, larger punctures 3–5 times their width apart (observable at 50 magnifications or more). (58) Scutellum contiguously punctate around margins, sparsely punctate centrally, punctures separated by 1–2 time their width. (63) Dorsal surface of propodeum (similar to Figure 334) nearly entirely smooth, weakly striolate laterally with very weak median striae confined to basal one-third; (64) surface extensively alveolated. (65) Metasomal tergum I shiny; (66) punctation fine, dense over most of dorsal surface, punctures slightly less than their width apart, becoming very sparse near and on anterior surface.

Coloration: (71) Wing membrane very weakly infuscated throughout.

Vestiture: (73) Unlike other species, vertex and frons covered with thick, recurved setae (simple recurved hairs are found in *L. acarophilum*, *L. circinatum*, *L. pharum*, and *L. uyacicola* but are not thick and pigmented as in *L. tropidonotum*); (74) pubescence of head mostly white, thickened setae on vertex and frons orange-brown. (75) Pubescence of thorax white; (76) mesoscutal hairs inconspicuous. (77) Hind tibial hair color differentiated, ventral and lateral hairs white, dorsal hairs brown. (78) Anterior hairs of metasomal tergum I white; (79) basal hair bands of terga II–III yellowish white, terga IV–V nearly entirely covered by yellowish, short pubescence. (80) Acarinarium absent, elongate hairs scattered over anterior surface of tergum I.

MALE: Similar to female except as follows: (1) length 7.5 mm (n = 1); (2) wing length 2.2 mm, (3) abdominal width 1.8 mm. (4) Head as in Figure 722 (length/width ratio 0.96). (5) Gena subequal to eye in width, (6) moderately produced posteriorly. (10) Clypeal surface noticeably depressed ventrally. Labrum similar to that of *L. asaphes* (Figure 277); (24) distal process absent; (25) basal area strongly depressed medially; (26) basal lateral depressions well developed. (30) Mandible moderately elongate, reaching just beyond opposing clypeal angle. (53) Clypeus pol-



FIGURES 719–723.—*Lasioglossum tropidonotum:* 719, male genitalia, ventral view; 720, same, dorsal view; 721, same, lateral view; 722, male head, frontal view; 723, female head, lateral view.

ished; (54) punctures well formed and dense basally, very fine and scattered over apical two-thirds becoming virtually impunctate medially near apical edge. (68) Clypeal maculation present. (69) Flagellum nearly entirely dark, only slightly paler ventrally than on dorsum. (72) Tarsi dark, concolorous with tibiae.

Vestiture: (82) Hairs on sternum IV erect, elongate, hairs becoming slightly longer laterally; (83) sternum V with median rosette of short erect hairs, becoming elongate and curled laterally.

Terminalia: Sterna VII–VIII virtually identical to those of *L. acarophilum,* Figure 256; (85) sternum VIII with sharply pointed median process. Genitalia as in Figures 719–721; (86) gonobase elongate; (87) gonostylus moderately elongate, sharply pointed; (89) retrorse membranous lobe tapering distally to acute apex; (90) volsella lacking prominent lateral lobe.

FLIGHT RECORDS.—Both known specimens of *Lasioglossum tropidonotum* were collected in March.

REMARKS.—The holotype female had a nearly full scopal pollen load, and the unusual thick setae on the frons and vertex of the head were caked with pollen grains (these hairs in nearly all *Lasioglossum* species are plumose and similar to other hairs on the head). This suggests that the head is possibly used to collect pollen directly from the floral anthers with the pollen being subsequently transferred to the hind legs for transport. If true, this method of pollen collecting and suggestion of possible floral specificity would be unique among *Lasioglossum* species. It should be noted that simple, recurved hairs on the frons and vertex are also found in *L. acarophilum*, *L. pharum*, *L. circinatum*, and *L. uyacicola*; however, the hairs here are very thin and do not appear thick enough to harvest pollen as suggested for *L. tropidonotum*.

SPECIMENS EXAMINED.—2 (1♀,1♂).

MEXICO. CHIAPAS: Ocosingo, 2 mi SE, 8 Mar 1953, E.I. Schlinger (1♂; UCB), 4 mi NW, 8 Mar 1953, R.C. Bechtel, E.I. Schlinger (1♀, holotype; CAS).

49. *Lasioglossum uyacicola* (Cockerell)

FIGURES 59, 372, 724–731

Halictus uyacicola Cockerell, 1949:445 [female].

Halictus uyacensis Cockerell, 1949:445 [female].—Michener, 1954:40 [synonymy].

Lasioglossum uyacicola.—Michener, 1954:40 [redescription, male].

TYPE MATERIAL.—The female holotype of *Halictus uyacicola*, in the National Museum of Natural History, Smithsonian Institution, is in excellent condition. It is labeled

Uyaca Peak Feb[ruary] 9. [handwritten by Cockerell]/Honduras Cockerell Exp.[edition]/209. [handwritten by Cockerell]/Type No. 58484 USNM [red label]/Halictus uyacicola Ckll [Cockerell] TYPE [handwritten by Cockerell; nearly illegible due to running of ink]

An additional female in the Smithsonian collection has the same locality data as the type but was not designated as being a paratype by Cockerell.

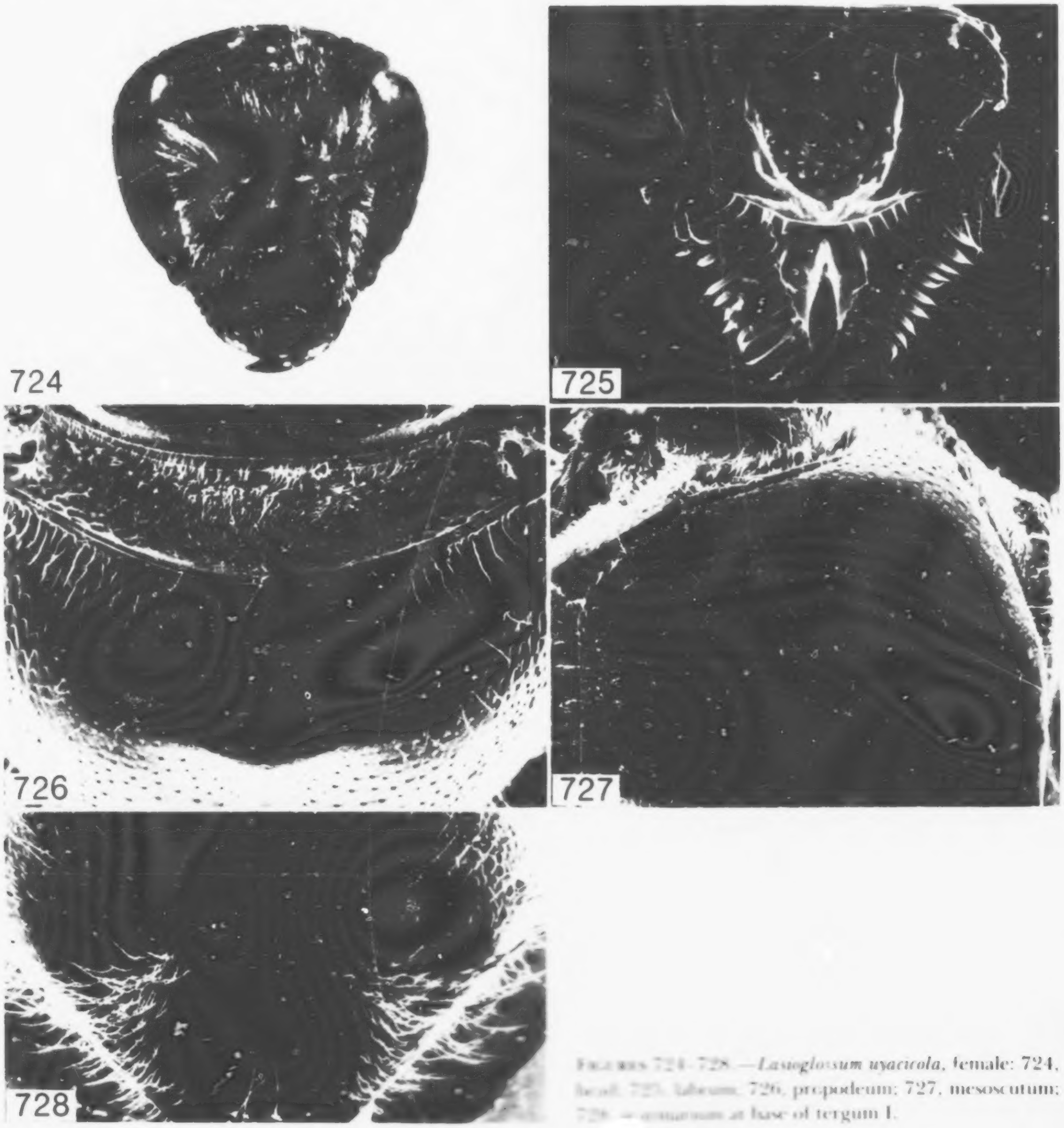
The female holotype of *Halictus uyacensis*, in the National Museum of Natural History, is also in excellent condition. The first three labels associated with this specimen are identical to those of the *H. uyacicola* type. The bottom two labels read

Type No. 58485 USNM [red label]/Halictus uyacensis Ckll [Cockerell] TYPE [handwritten by Cockerell; nearly illegible due to running of ink].

DISTRIBUTION (Figure 372).—*Lasioglossum uyacicola* is presently known from only 13 females and one male, which have been collected in Chiapas (Mexico), Honduras, Costa Rica, and Panama. The records from Panama represent the southernmost known limits of New World *Lasioglossum*.

DIAGNOSIS.—The doubly-punctate mesoscutum (Figure 727), presence of a large acarinarium (Figure 728), and the smooth posterior half of the propodeal surface (Figure 726) will distinguish *Lasioglossum uyacicola* from all other known New World *Lasioglossum*. *Lasioglossum acarophilum* is the most similar species to *L. uyacicola* and the two species occur sympatrically in Chiapas (Mexico). However, the mesoscutum of *L. acarophilum* is only obscurely doubly-punctate and is much more granuloso-punctate than that of *L. uyacicole* (Figures 251, 727). Furthermore, *L. uyacicola* has a relatively longer head (Figures 724, 246; length/width ratio 0.92–0.98, $x = 0.95$ vs. 0.88–0.96, $x = 0.91$). *Lasioglossum bajaense*, which is known only from the southern tip of Baja California, is similar but has a much shorter head (appearing slightly shorter than that of *L. athabascense*, Figure 228), relatively sparse mesoscutal punctation with the central punctures separated by their width or slightly more (punctures nearly contiguous in *L. uyacicola*), and has the posterior half of the propodeal dorsal surface polished and shiny (posterior half dull in *L. uyacicola*).

The smooth posterior half of the dorsal propodeal surface will distinguish the males of *L. uyacicola*, *L. acarophilum*, *L. argutum*, and *L. tropidonotum* from those of all other New World *Lasioglossum*. *Lasioglossum argutum* males can be quickly differentiated by the polished propodeal surface (posterior half dull in the other three species), and *L. tropidonotum* is unique in having a raised, median ridge on the anterior surface of the mesoscutum (Figure 174). *Lasioglossum uyacicola* and *L. acarophilum* males share a distinctive hair pattern on the posterior edge of sternum V (Figure 252) and along with *L. tropidonotum* are unique in having the retrorse membranous lobes



FIGURES 724–728.—*Lasioglossum uyacicola*, female: 724, head; 725, labrum; 726, propodeum; 727, mesoscutum; 728, acarinarium at base of tergum I.

of the genitalia distally pointed (Figure 729). The gonostyli of *L. uyacicola* may be longer than those of *L. acarophilum*, but as yet the males of these two species cannot be reliably differentiated (they are known to be sympatric only in Chiapas, Mexico).

DESCRIPTION.—FEMALE: (1) Length 8.2–9.0 mm ($\bar{x} = 8.6$, $n = 2$); (2) wing length 2.4–2.6 mm ($\bar{x} = 2.5$, $n = 2$); (3) abdominal width 2.6–2.9 mm ($\bar{x} = 2.75$, $n = 2$).

Structure: (4) Head elongate (Figure 724; length/width ratio 0.92–0.98, $\bar{x} = 0.95$, $n = 2$).

(7) Supraclypeal area somewhat narrowly rounded, (8) protuberant. (9) Clypeus projecting approximately 0.87 of its length below lower margin of eyes; (10) surface with obscure median longitudinal sulcation. (14) Distance between lateral ocelli subequal to distance between lateral ocellus and eye. (23) Flagellomere 1 subequal to 2 in length along dorsal surface. Labrum as in Figure 725; (27) distal keel moderately broad, lateral edges bowed; (29) distal lateral projections weakly developed, rounded to narrowly rounded; (29) fimbrial setae acutely pointed.

(32) Pronotal lateral angle moderately obtuse; (32) pronotal lateral ridge incomplete, interrupted by oblique lateral sulcus; (34) lower portion of lateral ridge sharply edged. (35) Mesoscutal lip weakly bilobed, (36) moderately elevated from pronotum. (40) Dorsal surface of propodeum about 0.75 the length of scutellum and about 1.4 times the length of metanotum, (41) slightly depressed centrally, (42) posterior margin broadly rounded; (43) propodeal triangle weakly defined, evident medially as an inconspicuous V-shaped elevation with very low lateral rims, fading towards metanotum; (44) lateral carinae not reaching midpoint of posterior surface. (45) Tibial spur as in Figure 59.

(46) Lateral edge of metasomal tergum II only faintly sinuate, virtually straight.

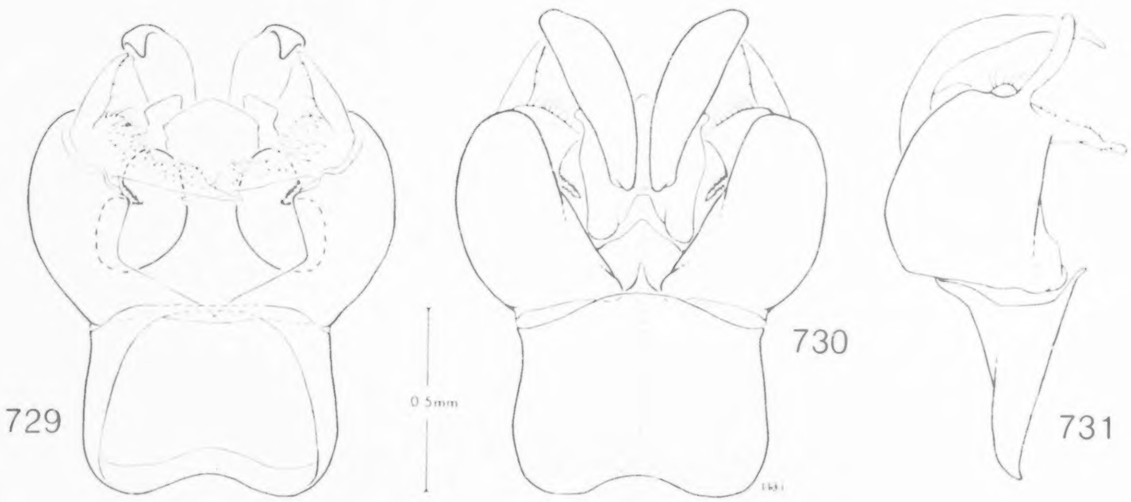
Sculpture: (47) Face dull granulate, (48) doubly-punctate, smaller punctures nearly contiguous, larger punctures separated by 1–2 times their diameter. (51) Supraclypeal area extremely granulate; (52) uniformly punctate, punctures separated by 1–3 times their width. (53) Clypeus granulate basally, apical half polished; (54) punctures separated by their width or less. (56) Mesoscutum moderately shiny; (57) punctation as in Figure 727, obscurely doubly-punctate, smaller punctures dense, nearly contiguous throughout, larger punctures separated by 3–4 times their width. (58) Scutellum obscurely doubly-punctate, smaller punctures separated at most by their width, larger punctures scattered (63) Dorsal surface of propodeum (Figure 726) striolate over basal two-thirds, posterior third smooth or with scattered, obscure rugulae; (64) surface alveolated. (65) Metasomal tergum I moderately shiny; (65) punctation very fine, extremely dense posteriorly, punctures nearly contiguous, becoming increasingly less dense towards impunctate anterior edge.

Coloration: (71) Wing membrane mostly hyaline, marginal cell and apex obscurely infuscated.

Vestiture: (73) Unlike most species, hairs between vertex and antennae conspicuously simple, recurved, contrasting with plumose hairs near antennae; (74) pubescence of head white. (75) Pubescence of thorax white; (76) mesoscutal hairs moderately dense, conspicuously plumose. (77) Hind tibial hair color differentiated, most hairs white, dorsal hairs brown to dark brown. (78) Anterior hairs of metasomal tergum I white, (79) basal hair bands of terga II–IV yellowish white. (80) Acarinarium present (Figure 728), a large, circular, glabrous area at base of tergum I, surrounded laterally and dorsolaterally by elongate fringe hairs; dorsal opening of acarinarium wide, opening slightly wider than width of lateral hair fringe as seen in dorsal view.

MALE: Similar to female except as follows: (1) length 8.8 mm (n = 1); (2) wing length 2.45 mm (n = 1); (3) abdominal width 1.9 mm (n = 1). (4) Head moderately elongate (length/width ratio 0.88, n = 1). (5) Gena slightly wider than eye, (6) moderately produced posteriorly. (10) Clypeal surface shallowly depressed ventrally. (24) Labral distal process absent; (25) basal area depressed medially; (26) basal lateral depressions conspicuously developed. (30) Mandible short, just reaching opposing clypeal angle. (53) Clypeus granulate basally, apical two-thirds weakly granulate, shiny; (54) punctures well formed, nearly contiguous basally, very fine and scattered over apical two-thirds. (68) Clypeal maculation present. (69) Flagellum light brown ventrally, contrasting with dark dorsum. (72) Tarsi dark, concolorous with tibiae.

Vestiture: (82) Hairs on sternum IV suberect, moderately elongate; (83) sternum V without conspicuous erect hairs, posterior sternal edge with straight-edged lateral hair lobes similar to



FIGURES 729–731.—*Lasioglossum uyacicola*, male genitalia: 729, ventral view; 730, dorsal view, 731, lateral view.

those of *L. acarophilum* (Figure 252).

Terminalia: (84) Sternum VII was not available for study; sternum VIII of the one available male was damaged (the median process was torn but the surrounding sternal edge indicates it is probably sharply pointed as in *L. acarophilum* and *L. tropidonotum* Figure 256). Genitalia as in Figures 729–731; (86) gonobase elongate; (87) gonostylus very elongate, slender; (89) retrorse membranous lobe tapering to sharply pointed apex; (90) volsella lacking prominent lateral lobe.

FLIGHT RECORDS.—Females of *L. uyacicola* have been collected in most months from February to December. The one known male was collected in January.

SPECIMENS EXAMINED.—14 (13♀, 1♂).

COSTA RICA. *Alajuela Prov.:* SE slope Volcan Poas, 15 July 1963, 7700 ft, Michener & Kerfoot (1♀; KU). *Cartago Prov.:* S slope Volcan Irazu, 28 Jun 1963, one in closed burrow in bank, 9200 ft (2♀; KU); Cartago, Nov 1965, N.L.H. Krauss (1♀; USNM). *San Jose Prov.:* Cerro de la Muerte, 6 km W Villa Mills, 23–26 Oct 1971, E.R. Heithaus (2♀; CU).

HONDURAS: Uyaca Peak, 4 Feb–23 Mar [1947?], Cockerell expedition (4♀; USNM; includes types of *L. uyacicola* and *L. uyacensis*).

MEXICO. CHIAPAS: San Cristobal de las Casas, 2 Aug 1956, J.W. MacSwain, D.D. Linsdale (1♀; CAS).

PANAMA. Bambito, Volcan Chiriqui, Dec 1946, N.H.L. Krauss (2♀; KU); Potrerillos, 27 Jan 1935, J.W. MacSwain (1♂; KU).

50. *Lasioglossum xyriotropis*, new species

FIGURES 504, 732

TYPE MATERIAL.—The holotype female of *Lasioglossum xyriotropis* is in the National Museum of Natural History, Smithsonian Institution. It is labeled

Pablillo, N.L. [Nuevo Leon] 23.VI [June] 1975 MEX.[ico]/J.F. Gillaspy Collector/HOLOTYPE Lasioglossum xyriotropis R.J. McGinley [red label].

The left pair of wings are folded under the specimen and pierced by the insect pin but otherwise the holotype is in excellent condition. Six female paratypes, listed in the "Specimens Examined" section, are herein designated; five are in the Snow Museum, University of Kansas, and one in the Cornell University Collection.

ETYMOLOGY.—The Greek words *xyrion* (small razor) plus *tropis* (keel) allude to the complete and very sharply edged pronotal lateral carina, characteristic of this species.

DISTRIBUTION (Figure 504).—*Lasioglossum*

AVAILABLE

xyriotropis is presently known only from three Mexican states: Morelos, Nuevo Leon, and Tlaxcala.

DIAGNOSIS.—Very characteristic of *L. xyriotropis* is the clypeus that is conspicuously and almost entirely granulate (only the extreme apicolateral edges are polished). Also diagnostic is the following character combination: head moderately short; pronotal lateral carina conspicuously complete and sharply edged (Figure 732); membrane of forewing mostly hyaline, marginal cell and apex infuscated; mesoscutum nearly entirely granuloso-punctate, punctures slightly less dense on central posterior surface, where they are nearly contiguous but distinctly separated. Like *L. manitouellum*, to which it is very similar, *L. xyriotropis* lacks an acarinarium and has a noticeably shiny, striolate-rugulose dorsal propodeal surface. *Lasioglossum manitouellum*, unlike *L. xyriotropis*, has an incomplete pronotal lateral carina, a slightly shorter head (Figure 505), and a completely granuloso-punctate mesoscutum (punctures not distinctly separated posteriorly).

Lasioglossum xyriotropis is also similar to *L. heterorhinum*, with which it shares the complete pronotal lateral carina. The following characters of *L. heterorhinum* will differentiate these two species: apical half of clypeus polished; head conspicuously short (Figure 458; compare with Figure 505); forewing membrane not infuscated.

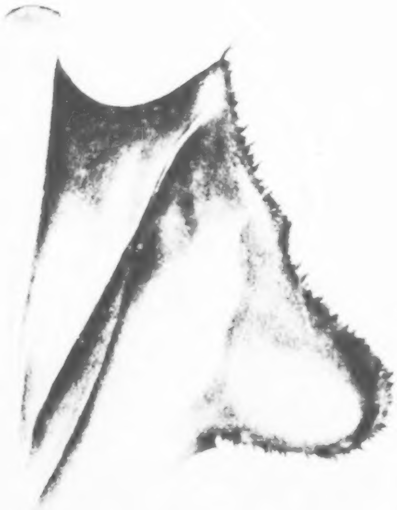


FIGURE 732.—*Lasioglossum xyriotropis*, female pronotum, lateral view.

DESCRIPTION.—FEMALE: (1) Length 7.9–9.6 mm ($\bar{x}$ = 8.8, n = 7); (2) wing length 2.4–2.7 mm ($\bar{x}$ = 2.5, n = 7); (3) abdominal width 2.6–2.9 mm ($\bar{x}$ = 2.7 mm).

Structure: (4) Head moderately short (slightly longer than that of *L. manitouellum*, Figure 505; length/width ratio 0.92–0.96, $\bar{x}$ = 0.95, n = 7). (7) Supraclypeal area evenly rounded, (8) moderately protuberant. (9) Clypeus projecting approximately 0.74 of its length below lower margin of eyes; (11) surface without median longitudinal sulcation. (14) Distance between lateral ocelli slightly shorter than distance between lateral ocellus and eye. (23) Flagellomere 1 slightly shorter than 2 along dorsal surface. (27) Labral distal keel broad in frontal view, somewhat spoon-shaped; (29) distal lateral projections virtually absent, evident as obscure lateral swellings; (29) fimbrial setae acutely pointed.

(32) Pronotal lateral angle obtuse; (33, 34) pronotal lateral ridge conspicuously complete, sharply edged (Figure 732). (35) Mesoscutal lip weakly bilobed, (36) moderately elevated from pronotum. (40) Dorsal surface of propodeum about 0.80 the length of scutellum and about 1.3 times the length of metanotum, (41) depressed centrally, (42) posterior margin broadly rounded; (43) propodeal triangle weakly defined, median V-shaped elevation and lateral rims inconspicuous; (44) lateral carinae extending over three-quarters the length of posterior propodeal surface, nearly reaching posterior edge of dorsal surface.

(46) Lateral edge of metasomal tergum II sinuate.

Sculpture: (47) Face shiny, (48) densely punctate below ocelli, punctures contiguous, only slightly less dense near antennae. (51) Supraclypeal area granulate throughout; (52) punctures separated by less than their width laterally, separated by 1–2 times their width centrally. (53) Clypeus nearly granulate throughout, polished only on extreme apicolateral edges; (54) punctures well formed basally, nearly contiguous, becoming larger and obscurely formed on apical half, separated by 1–2 times width. (56) Mesoscutum moderately shiny; (57) punctation similar to that in Figure 510, mostly granuloso-punctate, punctures nearly contiguous but distinctly separated on central posterior surface. (58) Scutellar punctures separated by their width centrally, nearly contiguous near edges (impunctate areas absent). (63) Dorsal surface of propodeum irregularly striate laterally, becoming ruguloso-striolate medially, striae and rugulae reaching posterior margin (similar to that in Figure 509); (64) surface obscurely alveolated (unlike most species except *L. manitouellum*, the propodeal dorsal surface is noticeably shiny). (65) Metasomal tergum I moderately dull; (66) punctation extremely fine, punctures virtually contiguous over most of doral surface.

Coloration: (71) Wing membrane nearly hyaline, lightly pigmented throughout with infuscated marginal cell and apex.

Vestiture: (74) Pubescence of head pale yellowish brown. (75) Pubescence of thorax mostly pale yellowish brown, pronotal hairs white in some specimens; (76) mesoscutal hairs moderately dense and plumose. (77) Hind tibial hair color differentiated, outer brown hairs contrasting with mostly pale to yellowish white hairs. (78) Anterior hairs of metasomal tergum I white, (79) basal hair bands of terga II–IV yellowish white. (80) Acarinarium absent, elongate hairs scattered over anterior surface of tergum I.

FLIGHT RECORDS.—One *L. xyriotropis* female was collected in April, the other six were taken in June.

MITE ASSOCIATES.—Although *L. xyriotropis* lacks an acarinarium, the one female from Morelos had numerous hypopodes clustered on the anterior surface of tergum I.

SPECIMENS EXAMINED.—7♀.

MEXICO. MORELOS: Cuernavaca, 4 mi NW, 12 Apr 1959, 7500 ft, H.E. Evans (1♀; CU). NUEVO LEON: Pablillo, 23 Jun 1975, J.F. Gallaspy (1♀ holotype; USNM). TLAXCALA: Apizaco, 8 mi W, 18 Jun 1961, 8200 ft, Univ. Kansas Mex. Exped. (5♀; KU).

51. *Lasioglossum zonulum* (Smith)

FIGURES 60, 205, 733–746

Halictus zonulus Smith, 1848:2171 [female, male].—Dalla Torre, 1896:92 [World catalog; see for older literature].—Atwood, 1933:451 [nests].—Brittain, 1933:94 [flower records].—Sandhouse, 1933:78 [synonymy].—Brittain and Newton, 1934:257, 260, 262 [locality and flower records].

Halictus similis.—Lovell, 1905:299 [misidentification of *L. zonulum* as evidenced by Lovell's 1908 synonymy of *H. craterus*].

Halictus craterus Lovell, 1908:35 [female, male; incorrectly identified as an *Evylaeus*].—Brittain and Newton, 1933:344 [locality and flower records]; 1934:262 [locality and flower records].—Sandhouse, 1933:78 [synonymy].—Covell, 1972:12 [lectotype, locality and flower records].

Halictus craternus.—Cockerell, 1916b:6 [lapsus calami].

Lasioglossum zonulum.—Michener, 1951:1107 [Nearctic catalog].—Evans and Lin, 1959:130 [predator, *Philanthus gibbosus* (Fabricius)].—Mitchell, 1960:346 [key, redescription].—Knerer and Atwood, 1962:163 [nests, locality and flower records].—Knerer, 1968:83 [presence in Austria].—Hurd, 1979:1958 [Nearctic catalog].

TYPE MATERIAL.—Smith based his descriptions of *Halictus zonulus* on a syntype series of more than one female and at least one male. I have examined one of the females of his type series, which is housed in the University Museum, Oxford. This female is in good condition; unfortunately, the associated label data was not recorded.

The female lectotype of *Halictus craterus* is in the National Museum of National History, Smithsonian Institution. It is labeled

Type No. 71566 U.S.N.M. [handwritten on red label]/224/Waldoboro [Lincoln County] Maine/Iris versicolor June 24–July 5 [handwritten]/Halictus craterus n. sp. Type ♀ [handwritten]/Halictus craterus Lov. [ell] Holotype [handwritten on red label]/LECTOTYPE ♀ Halictus craterus Lovell By C.V. Covell Jr. 1971.

The lecototype is in excellent condition; 28

paralectotypes are also in the Smithsonian Collection.

DISTRIBUTION (Figure 733).—Like *Lasioglossum leucozonium*, *L. zonulum* is a holarctic species, widespread in Europe. In the New World it is found in Canada and the northern United States from Cape Breton Island, Nova Scotia west to Quadra Island off the east coast of Vancouver Island, British Columbia (Hurd, 1979, recorded this species west only to Minnesota). The northernmost record is two males from Cranberry Portage, Manitoba (54°36′ north latitude). Southernmost records include one female from Page County, Iowa, and one female from Madison County, Indiana.

DIAGNOSIS.—For diagnosis of female *Lasioglossum zonulum* see *L. leucozonium* diagnosis.

Males of *L. zonulum* can be easily recognized by the distinctive hair tufts on sternum VI and the well-developed posterolateral lobes of tergum VII (Figure 205, 744). Like the males of *L. leucozonium*, the clypeus is rounded (not flattened as in most male *Lasioglossum*) and the dorsal propodeal surface is strongly striate to rugose. In addition to differences in sternal vestiture, *L. zonulum* males differ from those of *L. leucozonium* in having completely dark legs (middle and hind basitarsi yellow in the latter species).

DESCRIPTION.—FEMALE: (1) Length 8.5–10.5 mm ($\bar{x} = 9.7$, $n = 15$); (2) wing length 2.4–3.7 mm ($\bar{x} = 2.6$, $n = 15$); (3) abdominal width 3.0–3.5 mm ($\bar{x} = 3.2$, $n = 15$).

Structure: (4) Head elongate (Figure 734; length/width ratio 0.88–1.0, $\bar{x} = 0.94$, $n = 15$). (7) Supraclypeal area evenly rounded, (8) weakly protuberant. (9) Clypeus projecting approximately 0.81 of its length below lower margin of eyes; (11) surface without median longitudinal sulcation. (14) Distance between lateral ocelli subequal to distance between lateral ocellus and eye. (23) Flagellomere 1 longer than 2 along dorsal surface. Labrum as in Figure 736; (27) distal keel moderately broad in frontal view, gradually narrowing towards apex as in *L. leucozonium*; (29) distal lateral projections moderately well developed, weakly projecting; (29) fimbrial setae acutely pointed.

(32) Pronotal lateral angle narrowly obtuse, prominent with very well-developed dorsal ridge; (33) pronotal lateral ridge incomplete, interrupted by oblique lateral sulcus; (34) lower portion of lateral ridge inconspicuous, broadly rounded. (35) Mesoscutal lip rounded, not bilobed, (36) very strongly elevated from prono-

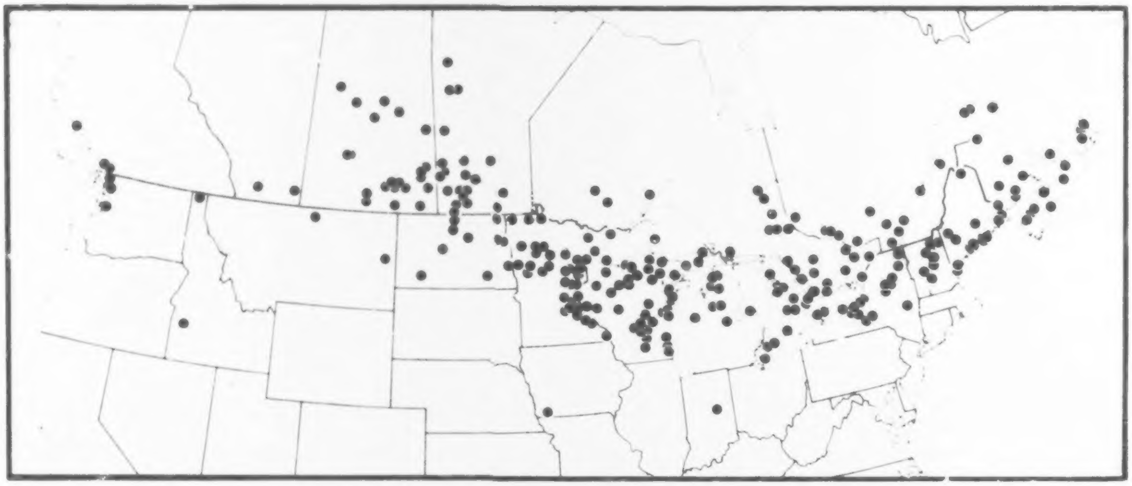
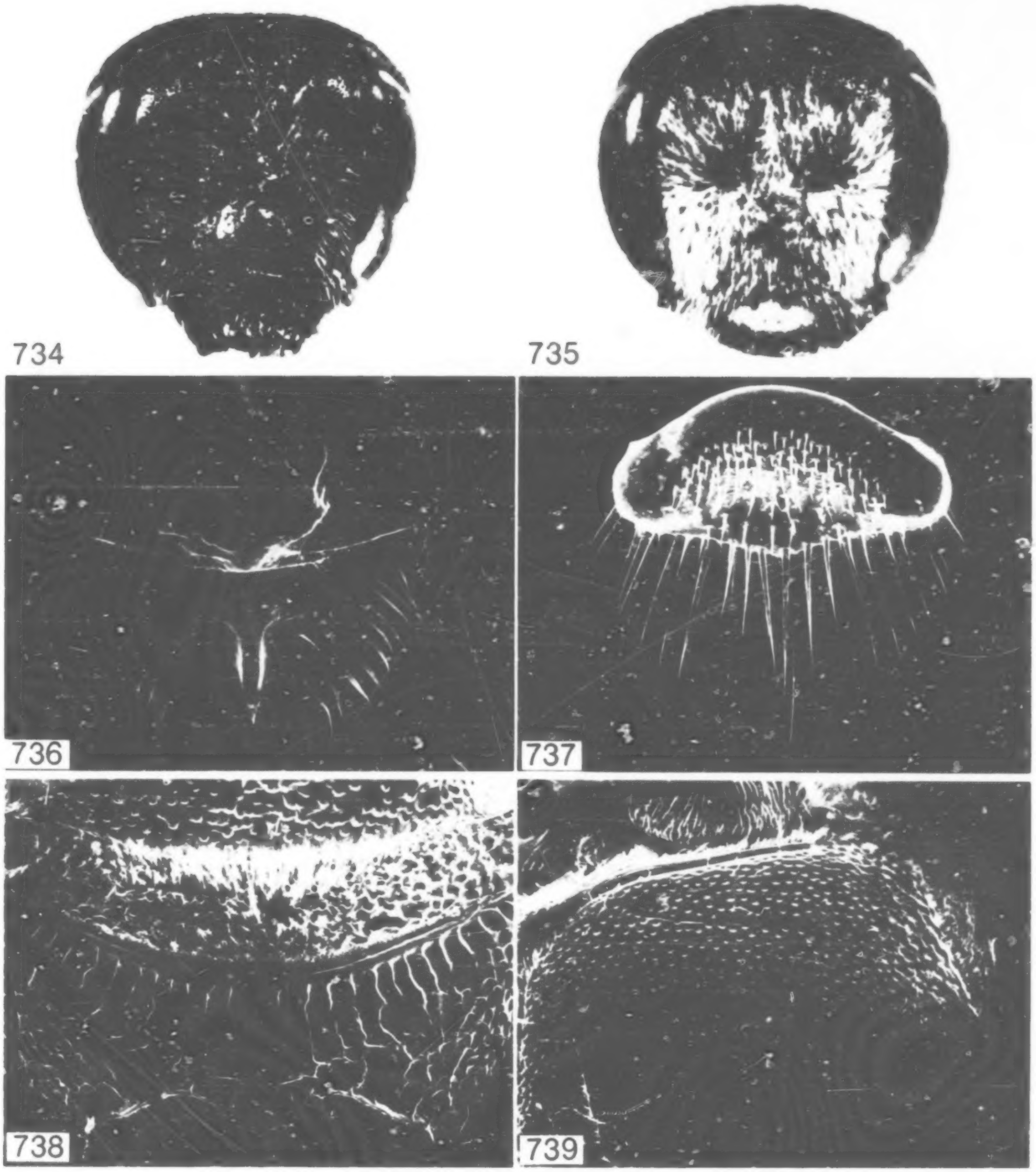


FIGURE 733.—New World distribution of *Lasioglossum zonulum*.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FIGURES 734–739.—*Lasioglossum zonulum:* 734, female head; 735, male head; 736, female labrum; 737, male labrum; 738, female propodeum; 739, female mesoscutum.

tum. (40) Dorsal surface of propodeum very short, about 0.53 the length of scutellum and slightly shorter than metanotum, (41) not depressed centrally, (42) posterior margin indistinctly truncated (lateral angles of dorsal surface gradually sloping from propodeal triangle); (43) propodeal triangle moderately well defined laterally; (44) lateral carinae nearly encircling posterior surface, interrupted dorsally. (45) Tibial spur as in Figure 60.

(46) Lateral edge of metasomal tergum II only faintly sinuate, virtually straight (similar to *L. leucozonium*).

Sculpture: (47) Face shiny, (48) densely punctate below ocelli, punctures contiguous, becoming somewhat punctuate below ocelli, punctures contiguous, becoming somewhat coarse near antennae. (51) Supraclypeal area extremely granulate; (52) uniformly and densely punctate, punctures separated by their width or less. (53) Clypeus obscurely granulate; (54) punctuation dense, nearly uniform, punctures separated by less than their width over basal two-thirds, separated by their width apicolaterally. (56) Mesoscutum shiny, (57) punctation as in Figure 739, punctures coarse, separated by their width or less laterally and anteriorly, becoming slightly less dense centrally, punctures 1–2 times their width apart. (58) Scutellar punctation coarse, similar to that of mesoscutum with widely separated impunctate areas. (63) Dorsal surface of propodeum (Figure 738) irregularly but very strongly striate with obscure transverse rugulae, striae reaching posterior margin; (64) surface smooth, not alveolated. (65) Metasomal tergum I shiny; (66) punctuation fine to very fine, moderately sparse posteriorly, punctures 1–1.5 times their width apart, very sparse anteriorly, punctures up to 4 times their width apart.

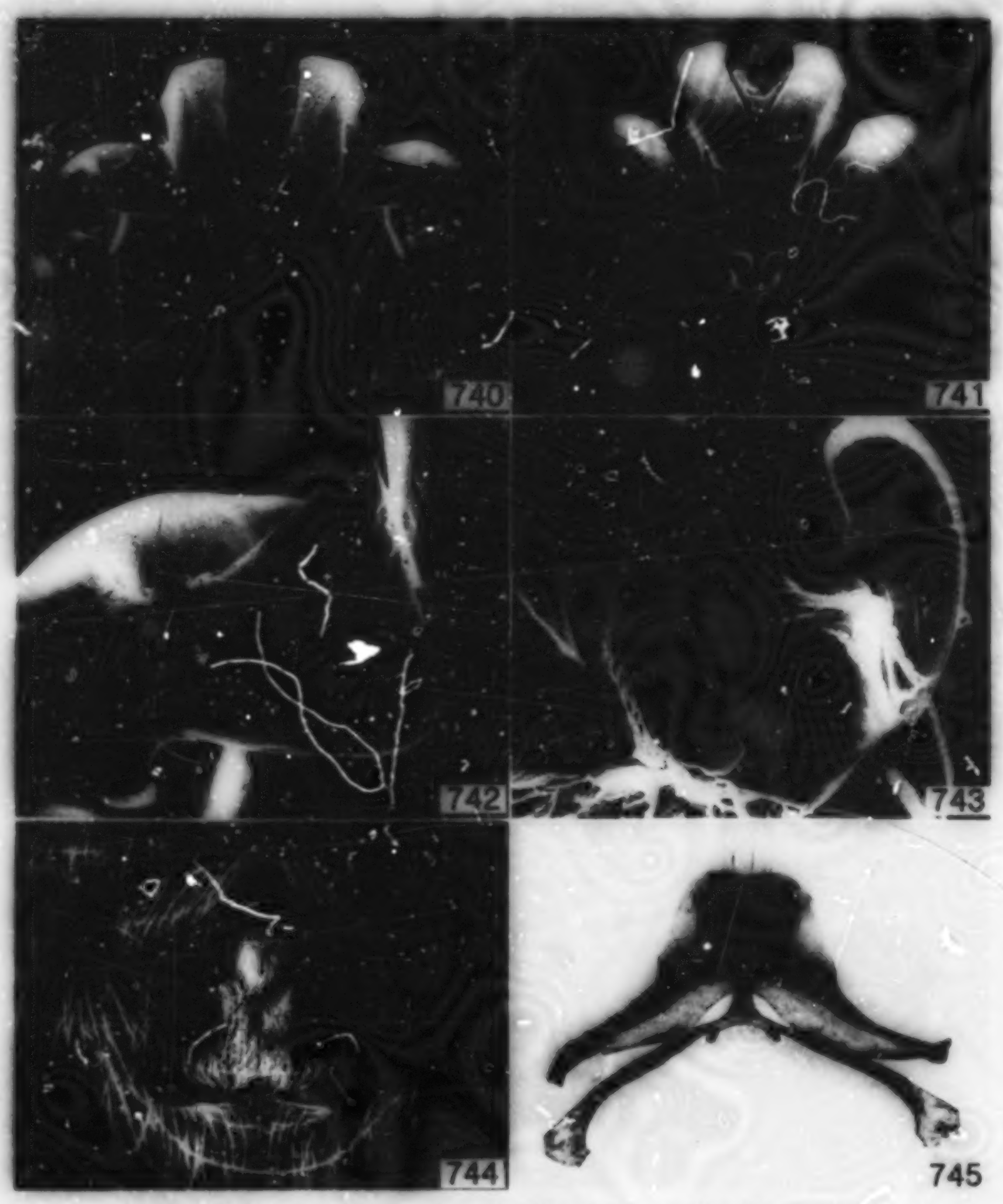
Coloration: (71) Wing membrane nearly hyaline, very lightly pigmented.

Vestiture: (74) Pubescence of head pale yellowish brown. (75) Pubescence of thorax white to pale yellowish brown; (76) mesoscutal hairs moderately dense and plumose. (77) Hind tibial hairs concolorous, yellowish brown. (78) Anterior hairs of metasomal tergum I and (79) basal hair bands of terga II–IV white. (80) Acarinarium absent, elongate hairs scattered over anterior surface of tergum I.

MALE: Similar to female except as follows: (1) length 7.4–9.2 mm ($\bar{x} = 8.5$, $n = 15$); (2) wing length 2.1–2.6 mm ($\bar{x} = 2.3$, $n = 15$); (3) abdominal width 2.2–2.6 mm ($\bar{x} = 2.5$, $n = 15$). (4) Head as in Figure 735 (length/width ratio 0.89–1.0, $\bar{x} = 0.93$, $n = 15$). (5) Gena conspicuously wider than eye, (6) rounded, not produced posteriorly. (10) Clypeal surface broadly rounded, not flattened or depressed. Labrum as in Figure 737; (24) distal process weakly developed, rounded; (25) basal area rounded medially, not depressed; (26) basal lateral depressions very weakly developed; unlike other species, labral sensilla conspicuously dense and elongate. (30) Mandible moderately elongate, reaching slightly beyond opposing clypeal angle. (53) Clypeus weakly granulate, shiny; (54) punctation nearly uniform throughout, punctures separated by less than their width. (68) Clypeal maculation usually present, often reduced, more rarely absent. (69) Flagellum entirely dark or only slightly paler on venter than dorsum. (72) Tarsi dark, concolorous with tibiae.

Vestiture: Sternal vestiture as in Figure 744; (82) hairs on sternum IV elongate, erect, without noticeable pattern; (83) posterior half of sternum V with band of short, suberect hairs surrounding a bare spot at the midpoint of the posterior sternal edge; (84) unlike other New World *Lasioglossum* except *L. leucozonium*, sternum VI with very characteristic vestiture here characterized by a glabrous surface having a circular basal hair tuft adjacent to a posterior X-shaped hair patch.

Terminalia: Sterna VII–VIII as in Figure 745; (84) sternum VII somewhat reduced, slender (similar to that of *L. leucozonium*); sternum VIII without median process (like *L. leucozonium* sternal disc reduced, narrow). Genitalia as in Figures 740–743; (86) gonobase short; (87) gonostylus robust, flat, broadly rounded apically (like *L. leucozonium*, gonostylus with inconspicouous



FIGURES 740–745.—*Lasioglossum zonulum*, male: 740, genitalia, ventral view; 741, same, dorsal view; 742, gonostylus; 743, volsella; 744, sternal vestiture; 745, sterna VII–VIII.

setae); (88) retrorse membranous lobe absent; (90) volsella with conspicuous lateral flange but lacking prominent lobe.

FLIGHT RECORDS (Figure 746).—*Lasioglossum zonulum* females have been collected from early April through October, with most records from late June and late July. The six April records are 3 females, Moorhead, Minnesota, 27 Apr 1947; 2 females Ile Jesus, Quebec, 15 Apr 1906; 1 female, Hull, Quebec, 26 Apr 1938. Most males have been collected in late July but records range from June through October. The six males collected in June were all from Brandon, Manitoba, 13 June 1949.

FLOWER RECORDS.—Females (273): Compositae 40%; Leguminosae 14%; Rosaceae 14%; Cruciferae 8%. Males (54): Compositae 41%; Leguminosae 30%. Total: 327 in 18 families, 45 genera as follows:

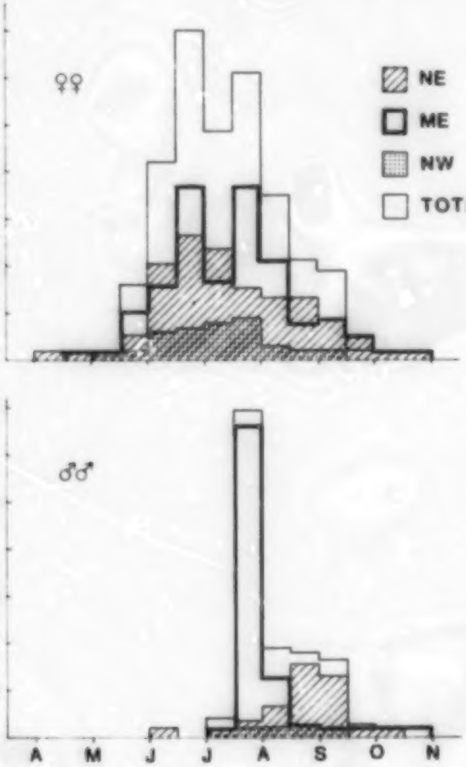


FIGURE 746.—*Lasioglossum zonulum* flight records.

Acer 1♂; *Achillea* 1♀; *Apocynum* 7♂; *Aralia* 1♀, 5♂; **Aster* 5(1)♀, 1♂; **Brassica* 6(1)♀; *Centaurea* 1♀; **Cirsium* 4(1)♀; **Cornus* 2(1)♀; *Crataegus* 1♀; *Cypripedium* 1♀; *Daucus* 3♀; **Epilobium* 10(2)♀, 1♂; **Fragaria* 7(3)♀; *Grindelia* 4♀, 3♂; **Helianthus* 3(1)♀, 1♂; **Heracleum* 1(1)♀; **Hieracium* 3(2)♀; *Iris* 7♀; **Leontodon* 4♀, 1♂, *Lonicera* 4♀; *Lotus* 1♀, **Lysimachia* 1(1)♀; **Medicago* 9(1)♀, 11♂; **Melilotus* 22(3)♀, 3♂; *Potentilla* 7♀; **Ranunculus* 21(1)♀, 1♂; **Raphanus* 14♀; **Rhus* 3(1)♀; **Rosa* 14(3)♀; *Rubus* 8♀; *Rudbeckia* 9♂; *Salix* 4♀; *Senecio* 1♀; **Solidago* 4(1)♀, 1♂; *Sonchus* 29♀, 6♂; **Sphaeralcea* 1(1)♀; **Spiraea* 1(1)♀; **Symphoricarpos* 3(3)♀, 1♂; *Tamarix* 2♀; *Tanacetum* 3♀; **Taraxacum* 46(4)♀; **Trifolium* 7(4)♀, 2♂; **Tragopogon* 3(3)♀; *Viburnum* 1♀.

SPECIMENS EXAMINED.—3255 (1802♀, 1453♂).

CANADA. **ALBERTA**: Elkwater, Lethbridge. **BRITISH COLUMBIA**: Abbotsford, Burns Bog, Haney. Pitt Meadows, Quadra Island. **MANITOBA**: Altona, Angusville, Assiniboine River, Aweme, Binscarth, Boissevain, Brandon, Carberry, Cranberry Portage, Dauphin, Douglas, Fisher Branch, Forrest (9 mi N), Gladstone, Glenboro (13 mi N), Horton, Husavick, Mafeking, Millwood, Minnedosa (5 mi N), Moose Lake, Ninette, Reynolds, Roblin, Russell, St. Lazare, Shilo (5 mi SW), The Pas, Turtle Mt., Virden, Wahless (1–2 mi N), West Hank Lake, Whitemouth, Whitewater (4 mi N), Winnipeg. **NEW BRUNSWICK**: Cambellton, Fredericton, Fundy National Park, Greys Mills, Hampton, Keswick, Kouchibouguac, Moncton, Nerepis, Red Rapids, St. Andrews, St. John, St. Stephen. **NOVA SCOTIA**: Algonquin Park, Baddeck, Big Harbor, Bridgetown, Cheticamp, Clyde River, Digby, Halifax, Ingonish, Kempt Shore, Kentville, Millsville, Pictou, Smith's Cove, Truro, West River, Weymouth, Woodville.

ONTARIO: Black Sturgeon Lake, Boat Lake, Bow Lake, Britania, Caledon, Cane, Carp (5 mi W), Chatham, Cloyne, Craigleith, DeGrassi Pt., Dyers Bay, Echo Bay (10 mi E), Englehart, Fergus, Franklin Island, Go Home Bay, Guelph, Hastings, Hilton Beach, Keewabeek, Kenora Iroquios Falls, Listowel (9.8 mi W), Manotick, Mattawa, Meaford, Merivale, Morrisburg, New Liskeard, North Bay, One Sided Lake, Orangeville, Orillia, Ottawa, Owen Sound, Pelle Island, Port Elgin, Port Sydney, Primrose, Rostrevor, Rutherglen, St. Catharines, St. Thomas, Sandford, Sturgeon Falls, Terra Cotta, Thornloe, Timagami, Tobermory, Toronoto, Trenton, Violet Hill, Waubamic, Wilcox Lake. **PRINCE EDWARD ISLAND**: Charlottetown, Prince Edward National Park. **QUEBEC**: Abbotsford, Cap Rouge, Cottage Beaulieu, Covey Hill, Fort Coulonge, Gaspe, Gracefield, Hemmingford, Hull, Ile Jesus, Ile de Montreal, Joliette, Kingsmere, Knowlton, Lac Nominque, Ladysmith, Laniel, La Trappe, Matane, Montcerf, Mont Joli, Montreal, Notre Dame du Portage, Quebec, Rouville, St. Anne's, St. Phillipe (2 mi N), Sherbrooke, Tenaga, Thurso, Val-Morin.

SASKATCHEWAN: Assiniboia, Big River, Candle Lake, Canora, Christopher Lake, Esterhazy, Estevan, Ft. Qu'Appelle, Good Spirit Lake, Green Lake, Greenwater Lake, Hatfield, Hudson Bay, Indian Head, Jane, Kandahar, Katepwa, Kenosee, Langham, Lumsden, Madge Lake, Minton, Moose Jaw (10 mi W), Mortlach, Prince Albert, Regina, Rockglen, Rushlake, Saskatoon, Torch River, Torquay, Viscount, Welby, White Fox, Willows, Yorkton.

UNITED STATES. IDAHO: *Ada Co.*: Regina, 1 mi W; *Boundary Co.:* Copeland. INDIANA: *Madison Co.:* Anderson. IOWA: *Page Co.*, Shenandoah. MAINE: *Arrostook Co.:* Fort Kent; *Franklin Co.:* Dryden, Rangeley; *Hancock Co.; Knox Co.:* Owls Head; *Lincoln Co.:* Boothbay, Waldoboro; *Penobscot Co.:* Bangor, Orono; *Washington Co.:* Eastport, Machias; *York Co.:* Saco. MICHIGAN: *Alger Co.; Baraga Co.; Charlevoix Co.; Cheboygan Co.; Chippewa Co.; Delta Co.; Dickinson Co.; Emmet Co.; Gogebic Co.; Houghton Co.; Huron Co.; Iron Co.; Keweenaw Co.; Mackinac Co.; Marquette Co.; Mason Co.; Menominee Co.; Midland Co.; Missaukee Co.; Ontonogan Co.; Ostego Co.; Roscommon Co.; Schoolcraft Co.* MINNESOTA: *Aitkin Co.; Anoka Co.; Becker Co.; Beltrami Co.; Carlton Co.; Carver Co.; Cass Co.; Chisago Co.; Clay Co.; Clearwater Co.; Cook Co.; Dakota Co.; Goodhue Co.; Hennepin Co.; Houston Co.; Itasca Co.; Kanabec Co.; Kittson Co.; Koochiching Co.; Lake Co.; Lake of the Woods Co.; Mille Lacs Co.; Otter Tail Co.; Pine Co.; Polk Co.; Ramsey Co.; Roseau Co.; St. Louis Co.; Sherburne Co.; Wabasha Co.; Wadena Co.; Washington Co.*

MONTANA: *Blaine Co.:* Chinook; *Dawson Co.:* Glendive. NORTH DAKOTA: *Benson Co.:* Esmond; *Bottineau Co.:* Turtle Mts.; *Case Co.:* Fargo; *Grand Forks Co.; Hettinger Co.:* unspecified locality; *LaMoure Co.:* unspecified locality; *McHenry Co.:* Towner, 11 mi N; *McLean Co.:* Garrison; *Pembina Co.:* Walhalla, 12 mi N; *Walsh Co.:* Golden Twp., Grafton. NEW HAMPSHIRE: *Coos Co.:* Lancaster; *Grafton Co.; Sullivan Co.:* unspecified locality. NEW YORK: *Albany Co.; Cayuga Co.; Clinton Co.; Cortland Co.; Essex Co.; Hamilton Co.; Herkimer Co.; Jefferson Co.; Monroe Co.; Niagara Co.; Ontario Co.; Oswego Co.; Seneca Co.; Tompkins Co.; Wayne Co.* VERMONT: *Caledonia Co.:* Danville, St. Johnsbury; *Essex Co.:* unspecified locality; *Windsor Co.:* Norwich. WASHINGTON: *King Co.:* Kirkland, Seattle; *Pierce Co.:* Clover Creek, Tacoma; *Skagit Co.:* Anacortes (5 mi S), Rockport State Park; *Whatcom Co.:* Bellingham. WISCONSIN: *Adams Co.; Bayfield Co.; Brown Co.; Clark Co.; Columbia Co.; Dane Co.; Door Co.; Dunn Co.; Florence Co.; Forest Co.; Green Lake Co.; Kewaunee Co.; Manitowoc Co.; Marquetts Co.; Milwaukee Co.; Oneida Co.; Ozaukee Co.; Price Co.; Racine Co.; Rusk Co.; St. Croix Co.; Shawano Co.; Vilas Co.; Washburn Co.; Waupauca Co.; Waushara Co.; Winnebago Co.*

BEST

Appendix 1

Lasioglossum Character Matrix

Unambiguous states of 48 characters; see "Phylogeny" for explanation of character numbers and states; number 9 indicates an unknown character state.

Character	123456789012345678901234567890123456789012345678
acarophilum	112112112111112221141112121221112111221311211111
acuminatum	112221113111113111111111111211111111131211111111
aequatum	119999229111122211321921121111999999991999999921
anhypops	112111112111112111111211111111911111121211111111
argutum	112112212121113221142111121111912111131211111121
asaphes	112112212121112211111111121111922111321211111211
athabascense	112111112111112111111111111111921111121211111111
bajaense	119999219111112121142921121221199999991999999921
bardum	119999119111112111111911121221199999991999999921
cercothrix	112111112111112211311121121112912111121211111121
channelense	112111113121112111111111121211221111121211111111
circinatum	119999129111112221141912121111999999991999999911
citerius	119999999212129211331911221111999999991999999921
colatum	112212112112112121111111111211211111121311111111
coriaceum	112211113111113111141111111211111111121211111111
costale	112112112111112211111121222111912111121211111121
crocoturum	112112112111112211111131121112912111121311111111
desertum	112111212111113111111111111221112111131211111121
egregium	112111112111112111111111111211221111121211111111
eickworti	221212113211112221111131222111911112911112111122
forbesii	112111112111113111111111111211111111131211111121
fuscipenne	111111122212123111111111111111912112911211111111
heterorhinum	112222113121113111111111111111912111131211112121
jubatum	112212213111112211111111121221122111131211111121
katyae	229999119211112221111931222111999999991999999922
lampronotum	112222113121113111111111111111912111131211112121
leucozonium	111112112112222111231111111111912212912113121111
manitouellum	112112112111112211111121121111912111121211111111
mellipes	112111112111112111111111111211222111121211111111
morrilli	112111112111113111111111111211111111131211111111
olympiae	111111121112121111131211111111912112911122111121
orphnaeum	112112123221122212131211222111921119911211111121
pacificum	111111121112121111131211111111912122911222111121

Character	123456789012345678901234567890123456789012345678
pallicorne	112112112121112211141111121221122111131311111121
paraforbesii	112211112111113111111111111121111111113121111111
parkeri	119999119121112211141911121211199999991999999921
pavonotum	112111111112112211111211111111912112911111111111
perscabrum	119999119221122212131911122111999999991999999921
pharum	119999119111112221141912121111999999991999999911
rupticristum	119999219111112211111911111111999999991999999921
sandrae	229999119211112211111931222112999999991999999922
sisymbrii	111111121112121111131211111111912122911122111121
timberlakei	111111121112121121131211111111912122911222111121
titusi	111112112112212121121111111111912112911111121121
transvorsum	112111212121112211111121121111912111321211111211
tricnicos	112112112111112211111131121111921111321311111121
trizonatum	112111112111112111111111111211222111121211111111
tropidonotum	112112122111112221141112121112912111221311211111
uyacicola	112112112111112221141112122211112111221311211111
xyriotropis	119999229121112211111921121111999999991999999921
zonulum	111112112212222111231111111111912212912113121111

Appendix 2

Identification of Figures in Keys

The following listing identifies the figures without legends utilized in the illustrated keys to *Lasioglossum* species.

Key to *Lasioglossum* Females North of the Mexican Border

83, *L. paraforbesii*, acarinarium at base of tergum I. 84, *L. colatum*, acarinarium at base of tergum I. 85, *L. anhypops*, tergum I without acarinarium. 86, *L. coriaceum*, acarinarium. 87, *L. transvorsum*, mesoscutal anterior edge. 88, *L. coriaceum*, dorsal propodeal surface. 89, *L. acarophilum*, acarinarium. 90, *L. acuminatum*, mesoscutal anterior edge. 91, *L. athabascense*, dorsal propodeal surface. 92, *L. forbesii*, acarinarium at base of tergum I, dorsal view. 93, *L. paraforbesii*, acarinarium at base of tergum I, dorsal view. 94, *L. acuminatum*, acarinarium at base of tergum I. 95, *L. forbesii*, acarinarium. 96, head. 97, *L. morrilli*, head. 98, *L. forbesii*, acarinarium at base of tergum I. 99, *L. morrilli*, acarinarium. 100, *L. channelense*, pronotum, lateral view. 101, *L. mellipes*, pronotum, lateral view. 102, *L. trizonatum*, head. 103, *L. mellipes*, head. 104, *L. jubatum*, head. 105, *L. acarophilum*, mesoscutum. 106, *L. paraforbesii*, mesoscutum. 107, *L. acarophilum*, dorsal propodeal surface. 108, *L. paraforbesii*, dorsal propodeal surface; 109, head; 110, dorsal propodeal surface; 111, acarinarium at base of tergum I. 112, *L. egregium*, head; 113, dorsal propodeal surface; 114, acarinarium. 115, *L. trizonatum*, lateral edge of tergum II. 116, *L. egregium*, lateral edge of tergum II. 117, *L. mellipes*, lateral edge of tergum II. 118, *L. paraforbesii*, head. 119, *L. jubatum*, head. 120, *L. bardum*, acarinarium. 121, *L. desertum*, acarinarium. 122, *L. bardum*, dorsal propodeal surface. 123, *L. desertum*, dorsal propodeal surface. 124, *L. titusi*, dorsal view of vertex. 125, *L. leucozonium*, dorsal view of vertex. Dorsal propodeal surfaces: 126, *L. titusi;* 127, *L. olympiae;* 128, *L. fuscipenne;* 129, *L. heterorhinum;* 130, *L. leucozonium*. 131, *L. fuscipenne*, mesoscutum. 132, *L. sisymbrii*, abdomen showing basal hair band on tergum I. 133, *L. coriaceum*, abdomen showing lack of basal hair band on tergum I. 134, *L. leucozonium*, head. 135, *L. olympiae*, head. 136, *L. zonulum*, mesoscutum. 137, *L. olympiae*, mesoscutum. 138, *L. zonulum*, tergum I. 139, *L. leucozonium*, tergum I; 140, vertex showing transverse striations behind ocelli. 141, *L. zonulum*, pronotal lateral angle. 142, *L. timberlakei*, mesoscutum. 143, L. olympiae, mesoscutum; 144, propodeum. 145, *L. pacificum*, propodeum. 146, *L. olympiae*, pleuron dorsad of middle coxa. 147, *L. pacificum*, pleuron dorsad of middle coxa. 148, *L. heterorhinum*, pronotum, lateral view. 149, *L. egregium*, pronotum, lateral view. 150, *L. manitouellum*, mesoscutum. 151, *L. anhypops*, mesoscutum. 152, *L. manitouellum*, forewing. 153, *L. mellipes*, forewing. 154, *L. anhypops*, lateral edge of tergum II. 155, *L. mellipes*, lateral edge of tergum II.

Key to *Lasioglossum* Females South of the Mexican Border

156, *L. morrilli*, acarinarium at base of tergum I. 157, *L. desertum*, acarinarium. 158, *L. morrilli*, head. 159, *L. pallicorne*, head. 160, *L. egregium*, pronotum, lateral view. 161, *L. pallicorne*, pronotum, lateral view; 162, acarinarium. 163, *L. parkeri*, acarinarium. 164, *L. jubatum*, dorsal propodeal surface. 165, *L. acarophilum*, dorsal propodeal surface. 166, *L. jubatum*, head. 167, *L. acarophilum*, head; 168, mesoscutum. 169, *L. uyacicola*, mesoscutum. 170, *L. argutum*, dorsal propodeal surface. 171, *L. cercothrix*, dorsal propodeal surface. 172, *L. argutum*, head. 173, *L. circinatum*, head. 174, *L. tropidonotum*, head and thorax. 175, *L. circinatum*, mesoscutum. 176, *L. pharum*, mesoscutum. 177, *L. eickworti*, forewing. 178, *L. manitouellum*, forewing. 179, *L. perscabrum*, dorsal propodeal surface. 180, *L. orphnaeum*, dorsal propodeal surface; 181, mesoscutum; 182, pronotum, lateral view. 183, *L. pallicorne*, head. 184, *L. transvorsum*, head; 185, dorsal propodeal surface. 186 *L. asaphes*, dorsal propodeal surface. 187, *L. aequatum*, dorsal propodeal surface. 188, *L. manitouellum*, dorsal propodeal surface.

Key to *Lasioglossum* Males North of the Mexican Border

189, *L. fuscipenne*, male sternal vestiture; 190, female mesoscutum (only female photographs were taken in cases where the sexes were similar for certain features). 191, *L. olympiae*, female dorsal propodeal surface. 192, *L. titusi*, female dorsal propodeal surface. 193, *L. heterorhinum*, female dorsal propodeal surface. 194, *L. sisymbrii*, female abdomen showing basal hair band on tergum I. 195, *L. coriaceum*, female abdomen. 196, *L. leucozonium*, female vertex, dorsal view. 197, *L. titusi*, female vertex, dorsal view; 198, male sternal vestiture. 199, *L. pacificum*, head. 200, *L. zonulum*, head. 201, *L. pacificum*, male sternal vestiture. 202, *L. timberlakei*, male sternal vestiture. 203, *L. olympiae*, male sternal vestiture. 204, *L. leucozonium*, male sternal vestiture. 205, *L. zonulum*, male sternal vestiture. 206, *L. coriaceum*, head. 207, *L. mellipes*, head. 208, *L. channelense*, head. 209, *L. lampronotum*, head. Male sternal vestiture: 210, *L. heterorhinum;* 211, *L. jubatum;* 212, *L. athabascense;* 213, *L. mellipes;* 214, *L. desertum*. 215, *L. athabascense*, head. 216, *L. trizonatum*, head. 217, *L. athabascense*, gonostylus. 218, *L. trizonatum*, gonostylus; 219, antenna showing circular tyli. 220, *L. egregium*, antenna (without tyli). 221, *L. mellipes*, male vestiture. 222, *L. forbesii*, male vestiture. 223, *L. paraforbesii*, head. 224, *L. forbesii*, head. Male sternal vestiture: 225, *L. acarophilum;* 226, *L. desertum;* 227, *L. manitouellum*. 228, *L. sisymbrii*, forewing. 229, *L. manitouellum*, forewing. Heads: 230, *L. colatum;* 231, *L. anhypops;* 232, *L. trizonatum*. Gonostyli: 233, *L. morrilli;* 234, *L. anhypops*.

Key to *Lasioglossum* Males South of the Mexican Border

235, *L. eickworti*, forewing; 236, head. Male sternal vestiture: 237, *L. tricnicos;* 238, *L. crocoturum;* 239, *L. jubatum;* 240, *L. heterorhinum;* 241, *L. pallicorne;* 242, *L. asaphes;* 243, *L. cercothrix;* 244, *L. costale*.

Literature Cited

Alcock, J., and G. J. Gamboa

1975. The Nesting Behavior of Some Sphecid Wasps of Arizona, Including *Bembix*, *Microbembix*, and *Philanthus*. *Arizona Academy of Science*, 10:160–165.

Atwood, C.E.

1933. Studies on the Apoidea of Western Nova Scotia with Special Reference to Visitors to Apple Bloom. *Canadian Journal of Research*, 9:443–457.

Bohart, G.E., and N.N. Youssef

1976. The Biology and Behavior of *Evylaeus galpinsiae* Cockerell (Hymenoptera: Halictidae). *Wasmann Journal of Biology*, 34:185–234.

Brittain, W.H.

1933. Apple Pollination Studies in the Annapolis Valley. *Canadian Department Agricultural Bulletin*, 162(4):91–134.

Brittain, W.H., and D.E. Newton

1933. A Study in the Relative Constancy of Hive Bees and Wild Bees in Pollen Gathering. *Canadian Journal of Research*, 9:334–349.

1934. Further Observations on the Pollen Constancy of Bees. *Canadian Journal of Research*, 10:255–263.

Cockerell, T.D.A.

1895. New Bees of the Genus *Halictus* from New Mexico, U.S.A. Annals and Magazine of Natural History, series 6, 16:63–69.

1897. The Bees of the Genus *Halictus* Found in New Mexico. *Transactions of the American Entomological Society*, 24:163–168.

1898a. Tables for the Determination of New Mexico Bees. *Bulletin of the Scientific Laboratories of Denison University*, 11:41–73.

1898b. New and Little-Known Bees. *The Canadian Entomologist*, 30:50–53.

1898c. New and Little-Known Bees from Washington State. *Proceedings of the Academy of Natural Sciences of Philadelphia*, 50:50–56.

1899. *Catalogo de las Abejas de Mexico*. 20 pages. Mexico: Biblioteca Agricola de la Secretaria de Fomento.

1905a. The Halictine Bees of America. *The American Naturalist*, 39:89–91.

1905b. Notes on Some Bees in the British Museum. *Transactions of the American Entomological Society*, 31:309–364.

1906. The Bees of New Mexico. *Transactions of the American Entomological Society*, 32:289–314.

1907. The Bees of Boulder County, Colorado. *University of Colorado Studies*, 4:239–259.

1908. Some Bees of the Genus *Halictus*. *Proceedings of the Entomological Society of Washington*, 9:119–120.

1909. Notes on Bees. *The Canadian Entomologist*, 41:334–335.

1910a. Descriptions and Records of Bees. *Annals and Magazine of Natural History*, series 8, 5:256–264.

1910b. Descriptions and Records of Bees. *Annals and Magazine of Natural History*, series 8, 6:272–284.

1916a. Some Rocky Mountain Andrenid Bees. *The Canadian Entomologist*, 48:252–254.

1916b. Bees from the Northern Peninsula of Michigan. *Occasional Papers of the Museum of Zoology, University of Michigan*, 23:1–10.

1918a. Some Halictine Bees in the United States National Museum (Hym.). *Proceedings of the Entomological Society of Washington*, 20:177–182.

1918b. Some Halictine Bees. *Entomologist*, 51:261–262.

1925. Bees in the Collection of California Academy of Sciences. *Proceedings of the California Academy of Sciences*, 14:185–215.

1930. Bees from Mesa Verde, Colorado, in the American Museum of Natural History. *American Museum Novitates*, 397:1–8.

1941. Observations on Plants and Insects in Northwestern Baja California, Mexico, with Descriptions of New Bees. *Transactions of the San Diego Society of Natural History*, 9:339–352.

1949. Bees from Central America, Principally Honduras. *Proceedings of the United States National Museum*, 98:429–490.

Covell, C.V., Jr.

1972. A Catalog of the J.H. Lovell Types of Apoidea with Lectotype Designations. *Proceedings of the Entomological Society of Washington*, 74:10–18.

Crawford, J.C.

1902. Notes and Descriptions of Bees. *The Canadian Entomologist*, 34:1–7.

1906. Synopsis of Bees of Oregon, Washington, British Columbia and Vancouver, V. *The Canadian Entomologist*, 38:297–304.

1907. New Halictinae from the Western United States. *Invertebrata Pacifica*, 1:190–197.

Cresson, E.T.

1872. Hymenoptera Texana. *Transactions of the American Entomological Society*, 4:153–292.

1874. Descriptions of New Hymenoptera. *Transactions of the American Entomological Society,* 5:99–102.

1916. The Cresson Types of Hymenoptera. *Memoirs of the American Entomological Society,* 1:1–141.

1928. The Types of Hymenoptera in the Academy of Natural Sciences of Philadelphia Other Than Those of Ezra T. Cresson. *Memoirs of the American Entomological Society,* 5:1–90.

Curtis, J.

1833. *British Entomology.* Volume 10, folio 448. London.

Dalla Torre, C.G. de

1896. *Catalogus Hymenopterorum.* Volume 10, viii + 643 pages. Leipzig.

Delfinado, M.D., and E.W. Baker

1976. New Species of Scutacaridae (Acarina) Associated with Insects. *Acarologia,* 18:264–301.

Duffield, R.M., A. Fernandes, C. Lamb, J.W. Wheeler, and G.C. Eickwort

1981. Macrocyclic Lactones and Isopentenyl Esters in the Dufour's Gland Secretion of Halictine Bees (Hymenoptera: Halictidae). *Journal of Chemical Ecology,* 7:319–331.

Ebmer, A.W.

1970. Die Bienen des Genus *Halictus* Latr. s.l. im Grossraum von Linz (Hymenoptera, Apidae), Teil II. *Sonderdruck aus Naturkundliches Jahrbuch der Stadt Linz,* 1970:19–82.

1972a. Neue westpaläarktische Halictidae (Halictidae, Apoidea). *Mitteilungen aus dem Zoologischen Museum in Berlin,* 48:225–263.

1972b. Revision der von Brullé Lucas and Pérez beschriebenen westpaläarktischen *Halictus*-Arten (Halictidae, Halictinae, Apoidea), sowie Festlegung des Lectotypus von *Lasioglossum (Evylaeus) angustifrons* (Vachal). *Polskie Pismo Entomologiczne,* 42:589–636.

1974a. *Halictus* Latr. et *Lasioglossum* Curt., Halictidae, Apoidea, Hymenoptera. in Beiträge zur Kenntnis der Fauna Afghanistans, *Časopis Moravského Musea Acta Musei Moraviae,* 59:183–210.

1974b. The Halictidae of Israel (Hymenoptera, Apoidea), II: Genus *Lasioglossum. Israel Journal of Entomology,* 9: 175–217.

1974c. Die Halictidae Makedoniens (Hymenoptera: Apoidea). *Acta Musei Macedonici Scientiarum Naturalium,* 14:45–66.

1975. Neue westpaläarktische Halictidae (Halictinae, Apoidea), Teil III. *Linzer Biologische Beitrage,* 7:41–118.

1976a. *Halictus* und *Lasioglossum* aus Marokko. *Linzer Biologische Beitrage,* 8:205–266.

1976b. Liste der mitteleuropäischen *Halictus* und *Lasioglossum. Linzer Biologische Beitrage,* 8:393–405.

1978a. *Halictus, Lasioglossum, Rophites* und *Systropha* aus dem Iran. (Halictidae, Apoidea) sowie neue Arten aus der Paläaktis. *Linzer Biologische Beitrage,* 10:1–109.

1978b. Die Bienen der Gattungen *Halictus* Latr., *Lasioglossum* Curt. und *Dufourea* Lep. (Hymenoptera, Halictidae) aus Korea. *Annales Historico-Naturales Musei Nationalis Hungarici,* 70:307–319.

1978c. Die Halictidae der Mandschurei (Apoidea, Hymenoptera). *Sonderdruck aus Bonner Zoologische Beitrage,* 29:183–221.

1979. Ergänzungen zur Bienenfauna iberiens die Gattungen *Halictus, Lasioglossum* und *Dufourea* (Apoidea, Hymenoptera). *Linzer Biologische Beitrage,* 11:117–146.

1980. Asiatische Halictidae (Apoidea, Hymenoptera). *Linzer Biologische Beitrage,* 12:469–506.

1981. *Halictus* und *Lasioglossum* aus Kreta (Halictidae, Apoidea). *Linzer Biologische Beitrage,* 13:101–127.

1982. Zur Bienenfauna der Mongolei die Arten der Gattungen *Halictus* Latr. und *Lasioglossum* Curt. (Hymenoptera: Halictidae) ergebnisse der mongolisch-deutschen biologischen Expeditionen seit 1962, nr. 108. *Mitteilungen aus dem Zoologischen Museum in Berlin,* 58:199–227.

1983. Asiatische Halictidae, II. (Apoidea, Hymenoptera). *Annales Historico-Naturales Musei Nationalis Hungarici,* 75:313–325.

Eickwort, G.C.

1969a. A Comparative Morphological Study and Generic Revision of the Augochlorine Bees. *University of Kansas Science Bulletin,* 48:325–524.

1969b. Tribal Positions of Western Hemisphere Green Sweat Bees, with Comments on Their Nest Architecture (Hymenoptera: Halictidae). *Annals of the Entomological Society of America,* 62:652–660.

1978. *Mexalictus,* a New Genus of Sweat Bees from North America (Hymenoptera: Halictinae). *Journal of the Kansas Entomological Society,* 51:567–580.

1979. Mites Associated with Sweat Bees (Halictidae). *Recent Advances in Acarology,* 1:575–581.

Eickwort, G.C., and R.L. Fischer

1963. A Morphological Study of the Tibial Spurs of Bees of the Subfamily Halictinae (Hymenoptera: Halictidae) of Eastern North America. *Annals of the Entomological Society of America,* 56:348–354.

Evans, H.E.

1955. *Philanthus sanbornii* Cresson as a Predator on Honeybees. *Bulletin of the Brooklyn Entomological Society,* 50:47.

1975. Nesting Behavior of *Philanthus albophilosus* with Comparisons between Two Widely Separated Populations. *Annals of the Entomological Society of America,* 68:888–892.

1982. Nesting and Territorial Behavior of *Philanthus barbatus* Smith (Hymenoptera: Sphecidae). *Jour-*

nal of the Kansas Entomological Society, 55:571–576.

Evans, H.E., and C.S. Lin

1959. Biological Observations on Digger Wasps of the Genus *Philanthus* (Hymenoptera: Sphecidae). *Wasmann Journal of Biology,* 17:115–132.

Fox, W.J.

1893. Report on Some Mexican Hymenoptera, Principally from Lower California. *Proceedings of the California Academy of Sciences,* 4:1–25.

Friese, H.

1916. Zur Bienenfauna von Costa Rica (Hym.). *Stettiner Entomologische Zeitung,* 77:287–350.

Graenicher, S.

1906. Some Notes on the Pollination of Flowers. *Bulletin of the Wisconsin Natural History Society,* 4:12–20.

1907. Wisconsin Flowers and Their Pollination, II. *Bulletin of the Wisconsin Natural History Society,* 5:84–95.

1909. Wisconsin Flowers and Their Pollinators. *Bulletin of the Wisconsin Natural History Society,* 7:19–77.

Griffiths, G.C.D.

1980. *Flies of the Nearctic Region.* Volume 1, part 1, 62 pages. Stuttgart: E. Schweizerbart'sche Verlagsbuchhandlung (Nagele und Obermiller).

Hansen, R.W., and E.A. Osgood

1983. Insects Visiting Flowers of Wild Red Raspberry in Spruce-Fir Forested Areas of Eastern Maine. *Entomological News,* 94:147–151.

Harris, R.A.

1979. A Glossary of Surface Sculpturing. *Occasional Papers in Entomology, State of California Department of Food and Agriculture,* 28:1–31.

Hefetz, A., M.S. Blum, G.C. Eickwort, and J.W. Wheeler

1978. Chemistry of the Dufour's Gland Secretion of Halictine Bees. *Comparative Biochemistry and Physiology,* 61(B):129–132.

Hurd, P.D., Jr.

1979. Apoidea. *In* K.V. Krombein, P.D. Hurd, Jr., D.R. Smith, and B.D. Burks, *Catalog of Hymenoptera in America North of Mexico,* 2:1741–2209. Washington, D.C.: Smithsonian Institution.

Hurd, P.D., Jr., W.E. LaBerge, and E.G. Linsley

1980. Principal Sunflower Bees of North America with Emphasis on the Southwestern United States (Hymenoptera: Apoidea). *Smithsonian Contributions to Zoology,* 310: 158 pages.

Hurd, P.D., Jr., and E.G. Linsley

1975. The Principal *Larrea* Bees of the Southwestern United States (Hymenoptera: Apoidea). *Smithsonian Contributions to Zoology,* 193: 74 pages.

Knerer, G.

1968. Zur Bienenfauna niederosterreichs: Die Unterfamilie Halictinae. *Zoologischer Anzeiger,* 181:82–117.

1969. Stones, Cement and Guards in Halictine Nest Architecture and Defense. *Entomological News,* 80:141–147.

Knerer, G., and C.E. Atwood

1962. An Annotated Check List of the Non-parasitic Halictidae (Hymenoptera) of Ontario. *Proceedings of the Entomological Society of Ontario,* 92:160–176.

1967. Parasitization of Social Halictine Bees in Southern Ontario. *Proceedings of the Entomological Society of Ontario,* 97:103–110.

Knerer, G., and P. MacKay

1969. Bionomic Notes on the Solitary *Evylaeus oenotherae* (Stevens) (Hymenoptera: Halictinae), a Matinal Summer Bee Visiting Cultivated Onagraceae. *Canadian Journal of Zoology,* 47:289–294.

Knerer, G., and M. Schwarz

1976. Halictine Social Evolution: The Australian Enigma. *Science,* 194:445–448.

Kumar, R., R.J. Lavigne, J.E. Lloyd, and R.E. Pfadt

1976. Insects of the Central Plains Experiment Range, Pawnee National Grassland. *Agricultural Experiment Station, University of Wyoming, Science Monograph,* 32: 74 pages.

LaBerge, W.E.

1964. Prodromus of American Bees of the Genus *Andrena* (Hymenoptera, Apoidea). *Bulletin of The University of Nebraska State Museum,* 4:279–316.

Linsley, E.G.

1962. Sleeping Aggregations of Aculeate Hymenoptera, II. *Annals of the Entomological Society of America,* 55:148–164.

Linsley, E.G., and J.W. MacSwain

1959. Ethology of Some *Ranunculus* Insects with Emphasis on Competition for Pollen. *University of California Publications in Entomology,* 16:1–46.

Linsley, E.G., J.W. MacSwain, and P.H. Raven

1963. Comparative Behavior of Bees and Onagraceae, I: *Oenothera* Bees of the Colorado Desert; II: *Oenothera* Bees of the Great Basin. *University of California Publications in Entomology,* 33:1–58.

Lovell, J.H.

1905. Some Maine Species of Halictus. *The Canadian Entomologist,* 37:299–300.

1908. The Halictidae of Southern Maine. *Psyche,* 15:32–40.

Michener, C.D.

1944. Comparative External Morphology, Phylogeny, and a Classification of the Bees (Hymenoptera). *Bulletin of the American Museum of Natural History,* 82:151–326.

1951. Genus *Lasioglossum. In* C.F.W. Muesebeck, K.V. Krombein, and H.K. Townes, Hymenoptera of America North of Mexico—Synoptic Catalog. *Agriculture Monograph,* 2: 1420 pages. Washington, D.C.: United States Department of Agriculture.

1954. Bees of Panamá. *Bulletin of the American Museum of Natural History,* 104:1–175.

1974. *The Social Behavior of the Bees.* Cambridge, Massachusetts: Harvard University Press. 404 pages.

1978. The Classification of Halictine Bees: Tribes and Old World Nonparasitic Genera with Strong Venation. *University of Kansas Science Bulletin,* 51:501–538.

Mitchell, T.B.

1960. Bees of the Eastern United States. *North Carolina Agricultural Experiment Station, Technical Bulletin,* 141(1): 538 pages.

Moldenke, A.R., and J.L. Neff

1974. The Bees of California: A Catalogue with Special Reference to Pollination and Ecological Research. *Origin and Structure of Ecosystems (IBP) Technical Report,* 74-5: 189 pages.

Moure, J.S., and P.D. Hurd, Jr.

1986. An Annotated Catalog of the Halictid Bees of the Western Hemisphere (Hymenoptera: Halictidae). Washington, DC: Smithsonian Institution Press.

Ordway, E.

1966. Systematics of the Genus *Augochlorella* (Hymenoptera, Halictidae) North of Mexico. *University of Kansas Science Bulletin,* 46:509–624.

Provancher, L.

1882. *Le Naturaliste canadien.* Volume 13. Québec.

1883. *Faune entomologique du Canada e particulièrement de la province de Quebéc.* 191 pages. Quebéc.

1888. *Additions et corrections au volume II de la faune entomologique du Canada, traitant les Hyménopteres.* 472 pages. Québec.

Reinhard, E.G.

1924. The Life History and Habits of the Solitary Wasp, *Philanthus gibbosus. Smithsonian Annual Report for 1922,* 1924:363–376.

Roberts, R.B.

1972. Revision of the Bee Genus *Agapostemon* (Hymenoptera: Halictidae). *University of Kansas Science Bulletin,* 49:437–590.

Robertson, C.

1890. New North American Bees of the Genera *Halictus* and *Prosopis. Transactions of the American Entomological Society,* 17:315–318.

1894. Flowers and Insects—Rosaceae and Compositae. *Transactions of the American Entomological Society,* 17:315–318.

1902. Synopsis of Halictinae. *Canadian Entomologist,* 34:243–250.

1918. Some Genera of Bees (Hym.). *Entomological News,* 29:91.

1929. *Flowers and Insects: Lists of Visitors of Four Hundred and Fifty-three flowers.* 221 pages. Lancaster, Pennsylvania: Science Press Printing Company.

Rust, R., A. Menke, and D. Miller

1985. A Biogeographic Comparison of the Bees, Sphecoid Wasps, and Mealybugs of the California Channel Islands (Hymenoptera, Homoptera). *In* A.S. Menke and D.R. Miller, editors, Entomology of the California Channel Islands. In *Proceedings of the First Symposium, Santa Barbara Museum of Natural History,* pages 29–59.

Sandhouse, G.A.

1933. Notes on Some North American Species of *Halictus* with the Description of an Apparently New Species (Hymenoptera: Apoidea). *Proceedings of the Entomological Society of Washington,* 35(5):78–83.

Sandhouse, G.A., and T.D.A. Cockerell

1924. Expedition of the California Academy of Sciences to the Gulf of California in 1921: The Bees, II. *Proceedings of the California Academy of Sciences,* series 4, 13:333–339.

Schrank, F. von P. von

1781. *Enumeratio insectorum Austriae indigenorum.* Augsburg: Apub Viduam E. Klett et Frank.

Smith, F.

1848. Descriptions of the British Species of Bees Belonging to the Genus *Halictus* of Latreille. *Zoologist,* 6:2037–2044.

1853. *Catalogue of Hymenopterous Insects in the Collection of the British Museum, Part I: Andrenidae and Apidae.* 197 pages. London.

1879. *Descriptions of New Species of Hymenoptera in the Collection of the British Museum.* 240 pages. London.

Stockhouse, R.E. II, and H. Wells

1978. Pollination Ecology of *Chlorogalum pomeridianum* (D.C.) Kunth. (Liliaceae). *Bulletin of the Southern California Academy of Science,* 73:124–129.

Tangelder, I.R.M.

1983. A Revision of the Crane Fly Genus *Nephrotoma* Meigen, 1803, in North America (Diptera, Tipulidae), Part I: The *Dorsalis* Species Group. *Beaufortia,* 33:111–205.

Thorp, R.W., D.S. Horning, Jr., and L.L. Dunning

1983. Bumble Bees and Cuckoo Bumble Bees of California. *Bulletin of the California Insect Survey,* 23:1–79.

Vachal, J.

1904. *Halictus* nouveaux ou présumés nouveaux d'Amérique (Hymenoptera). *Bulletin de la Société Scientifique, Historique et Archéologique de la Corrèze,* 26:469–486.

Whitsel, R.H., and R.F. Schoeppner

1971. Two Mites and Their Insect Hosts from San Mateo County, California. *Proceedings of the Entomological Society of Washington,* 73:223.

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